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ADDRESS DELIVERED AT THE OPENING OF THE SEVENTY-SEVENTH SESSION OF THE ALBANY MEDICAL COLLEGE, SEPTEMBER 24, 1907

Gentlemen: We assemble to-day to inaugurate the seventy-seventh lecture session of the Albany Medical College. The need of any formal beginning has often been questioned, but the custom has been long established and there seems to be a certain propriety in maintaining old forms when they do not impede modern progress. To those here present who to-day begin, in a definite way, their medical study, this hour, which marks their entrance to a noble profession, is fraught with interest. It is for them a point of departure, and at such a time it may be that some, even of the seemingly insignificant things, said or done may make a lasting impress upon the mind, influence thought, or cast new light upon some problem which confronts them. In this hope I shall presently address myself particularly to these newcomers who eagerly, perhaps anxiously and very seriously, anticipate the experience which coming years have in store, but first of all it is proper that, as a representative of the faculty, I should extend to you all a most cordial welcome. Those who are coming back again feel, we hope, at home in their surroundings, and need not to be assured that they are welcome, but to him who is as yet a stranger within our gates we ex-

tend most cordial greeting. It is our hope that he may be one with us in all the aims and interests which we have in common, and that no seeming indifference on our part, or aloofness on his, may hinder him from taking the place to which he is entitled and obtaining every advantage and benefit which comes to those who are engaged in a common pursuit if so be they will ally themselves with their fellow-workers and thus secure their share of the inspiration to be derived by those who are bound together by a common tie and are striving to reach the same goal. To this community of interests I shall later on allude, because I am convinced by long experience that no little evil and loss comes to some from lack of proper apprehension of this matter, and while it may be that those who are continuing and not entering upon their studies here, and whose student habits are in some measure established, will be little influenced by anything said, I am encouraged to hope that some of those who find themselves in new surroundings may be ready to receive some new truth, or view some old one in a new light, so that it may impress itself upon the mind and influence in some degree their conduct. And this, as already intimated, is one of the advantages which such occasions as the present possess—that there are certain days in life and periods in the history of every individual when even the little things make their mark and find a lodgment in the memory. Which fact affords, as we have seen, some reason, or at least excuse, for such observances as this, which however perfunctory they may seem to some are yet by no means devoid of interest to others and may be made in some degree profitable to those who are disposed to view them aright.

This occasion has for me no ordinary interest. I stand to-day where on a similar occasion and for a like purpose I stood thirty-two years ago, and again twelve years ago, and as the duty which has for this third time been delegated to me is assigned in rotation to the members of our faculty it is in the highest degree improbable that I shall ever discharge it again. For many years as student and instructor, and for twenty-five years just closing as registrar, I have been connected with this school, and I can not look about me without recalling the faces of those under whose instruction I sat, whom personally I have known, or with whom as teacher I have been associated, many of them long gone, who from this place have addressed successive classes occupying the seats which you are filling to-day. Two of these were founders of the school—the brilliant surgeon March, and the versatile and accomplished anatomist Armsby, whose faces look down upon us from the canvases before you, and among those who at a later period became connected with the school were Dean and Harris in medical jurisprudence, and the dignified Scotchman of the old school, McNaughton, and the elder Vander Poel in the department of practise; Quackenbush and Seymour in obstetrics; Pomfret and Webster in physiology; Haskins in anatomy; Lansing in materia medica, and Porter, J. S. Mosher and Perkins in chemistry. Coming into the faculty later, and after its reorganization in 1876, were Swinburne in surgery, Gray and E. R. Hun in neurology, and F. Townsend in physiology. Dr. Thomas Hun had withdrawn from active participation in college affairs before my time, though he served as emeritus professor and dean of the faculty from 1876 until his death twenty years later, and Dr. Howard Townsend had just passed off the scene when I came on it as a student. These men and many others, for I have named only those whom personally I have

known and none of the living, will be remembered so long as the history of this school shall endure, for they labored zealously in creating, upbuilding and successfully maintaining it. We do not recall the fact to find warrant for our present existence, nor can we claim lenient judgment for present performance by reason of distinguished services rendered by our predecessors, but we may find both incentive and encouragement in the contemplation of their work, and I take it that it is as true of institutions as of individuals that a line of reputable ancestors is something to be thankful for and on the whole no unimportant asset.

The place in which we meet compares but indifferently perhaps with the showy buildings in which many schools are housed. To the newcomer it may not be impressive, but since mind is more than matter, individuals more than piles of brick and mortar, and an elegant material environment in itself no evidence of intellectual profundity or productivity in its tenants, you need find in this fact no reason for discouragement. Plato in the groves, Socrates in the streets of Athens and Christ in the market-place, remain types of the true scholar and real teachers of mankind, and while conditions have changed essential truths are in no way altered. Our academies need a better housing than groves afford, and our teachers a more elaborate apparatus than sufficed for ancient philosophers, but in our thinking we should take care to estimate things at their real and not at fictitious worth or we shall place too high a value upon material things in the sphere of education and science. Here the real values are incorporeal, intellectual and spiritual, not material and directly convertible into dollars, nor are they directly producible by wealth. We stand in a great library, perhaps under the dome of the British Museum. Here are a million books collected at great labor and cost from all parts of the world and containing much of its best wisdom, but they are powerless to impart their knowledge to those who merely stand and gaze. And even he who longs to learn that which they hold in store is powerless to employ with real advantage more than the smallest fractional part of their great wealth. This wealth is like the energy potential in the coal deep buried in the earth, which must be mined with great toil, and burned to advantage, to convert it into impelling force and operating energy. Great fortunes, wisely employed, may render incalculable service to mankind, but it is an idle dream to suppose that dollars are directly convertible into brains, and that great gifts to education necessarily produce results proportional to their extent. Education, which is mental culture and implies a training of the faculties and development of the senses, is not on tap to be obtained by the turning of a faucet. When I survey the bewilderingly complex curriculums presented in the announcements of some of our universities I am reminded of the elaborate *menu* which is placed before the guest at a great hostelry. Everything is offered and one may choose this, and reject that, as his desires are simple or his greed consuming, but only that which is digested and assimilated serves the purposes of food and becomes a part of the body. Physical gain is not to be measured by the extent of the repast, nor is intellectual gain to be estimated by courses pursued, hours spent, experiments performed, books read, or even examinations passed. To hold otherwise is to entertain a very material conception and place too high an estimate on the value of the mechanical and material, the objective and external things which may be used to train and develop, but which can not create,

the subjective faculties which are the real entities because they are the springs of action.

Let us look at this matter a little more closely, observing at the outset that for the carrying on of original investigation in most departments of science, and more especially in the physical sciences, money, and much of it, may be required. But I am not considering the needs of the investigator, nor the cost of carrying on his work, which may be great, ought to be met, and generally is, in one way or another, provided for. I have more particularly in mind the needs of institutions like our own, in which the work is mainly educational, not creative, and in which pupils are seeking to acquire some small part of the sum total of the world's accumulated and classified knowledge. Such pupils form the vast majority of those who attend our common schools and academies, our colleges and so-called universities, and our technical and professional schools as well. The average teacher in these institutions is himself not a genius, for the world's supply of such would scarce suffice to fill the places, but if he be competent and conscientious he is fulfilling a true mission, and the great work of education is carried on by teachers of this class. If he be deficient in those qualities which enable the born teacher to uplift his pupils, develop latent capacities, stimulate lagging energies, and broaden their mental outlook, so much the worse for him and his pupils, but his work is not to be condemned because much of it is but the repetition to successive classes of the rudiments of knowledge. He is dealing with the average intellect and with ordinary needs, and his work may be humble but it is not contemptible. It is honorable and all-important, and lies at the very root of our civilization and the intellectual progress of the race. Geniuses are born, not made. They soon outrun their instructors, and have indeed little need of them, being generally their own best teachers and the teachers of others. No complex apparatus, nor educational system, can create or even do much to develop them, and the chief function of the teacher, and main aim of education, must ever be to classify, preserve, render available and transmit the world's knowledge to the largest number of people who will receive it.

Now to carry on much of this work of education extraordinary facilities are not necessarily required. Ordinary results are secured by the employment of ordinary means. Unless we establish a standard of ideal and absolute excellence and perfection, and demand that the teacher shall conform to such standard or cease his teaching, we must needs be patient and tolerant of present, though imperfect, conditions. To abolish schools whatever their grade, because the teaching force is not of the highest, the equipment not of the best, and the results obtained not entirely satisfactory, would be folly indeed. And yet this is essentially what some idealists would seem to advise. What shall be thought, for instance, of the sanity of a critic who has said at a conference of state medical examining boards recently held in Chicago, that of the one hundred and fifty medical schools in this country only six were what they ought to be. We may well inquire of this critical essayist—whose opinion as to what medical schools "ought to be" is to be taken? Are we to assume that the school with which the critic is connected is one of the six that are what they "ought to be"? If so, does it represent perfection? The absurdity of such utterances is the more clearly seen when we consider how far short of perfection are the results of all human endeavor. Churches, social organizations and philanthropies, legislative

bodies, courts and political parties are not what they "ought to be," but are they to be indiscriminately condemned, and are we to be told that we should be better off without them! Aside from an abstract sense in which it may be said that only pure truth and absolute perfection are admirable, and all error, incompleteness and insufficiency is abhorrent, it can not be maintained that the existing machinery employed by men collectively in society serves no good purpose because of its imperfections. Such a view underlies much anarchistic philosophy, discourages the endeavor of those who are laboring to better existing conditions, and retards progress. In the discussion of educational problems the inferences and strictures of irrational critics are unproductive of good result, harmful in many ways, and their recommendations if carried into effect would work irreparable injury to our educational system.

In the sphere of education we have been, it seems to me, unduly impressed by mere size and extent of output. Having observed the advantages that in the industrial world accrue from combination and the annihilation of competition, and learned that profit depends upon increased output, diminished cost of production and control of the market, it has seemed to some fair to assume that the larger schools should be able to afford better educational facilities, and these at a lower cost, than the smaller ones, and that these therefore ought to be strengthened since they would seem to be destined in time to extinguish their weaker and less favored competitors. We are often told that the small college will have to go, and so convincing appear many of the arguments of those who hold this view that it is not surprising that they find ready acceptance among philanthropic millionaires who are seeking for channels into which they may turn some of their surplus wealth. But what are in reality the results of this concentration which produces in some cases a kind of monopoly, and what may we expect them to be in the future, are questions well worth raising. This rather startling fact I think is one of them, that our richest and most liberally endowed colleges and universities are the most expensive to the student, and that in proportion to their gain in wealth the cost of attendance upon them increases. In other words, large capital, extensive plants and increasing patronage do not seem to reduce the cost of the educational output. This is not in accordance with economic laws as we observe their operation in the industrial world, but the fact is one not difficult to explain. Increased attendance means larger buildings, with more lecture rooms and laboratories, and a larger teaching force, and the cost of providing these may greatly exceed the increased revenue from tuition fees, so that large patronage by no means implies diminished cost of maintenance *per capita*, but often the reverse, and for this reason some of our colleges are now seriously considering the advisability of limiting the size of the entering classes either arbitrarily or by raising their entrance requirements. Nor can it be said that the larger institutions give so much better a return that the greater cost to the student is simply proportional to its real value. This view might be urged with some show of reason, for while it is a simple matter to determine the value of the material output of a manufacturing concern it is by no means easy to estimate moral and intellectual values. All sorts of arguments might be advanced as to better teachers because of better salaries, and better teaching because of better equipment. I do not propose to debate the question, but I hardly suppose that any one would claim

that there is any definite relation between the size or wealth of an educational institution and its real effectiveness, so that it might be said for example in the case of an institution having a million dollars invested in its plant and another million in endowments, that, if these were doubled the institution would be capable of doing doubly efficient work. I take it that no reasonable person would undertake to maintain such a proposition as this, and yet some such notion seems to be entertained by some people who are unreasonably impressed by large figures and discover a relation between bigness and excellence that is invisible to more judicious observers. If the money given to education was in all cases as wisely employed as that which has been applied to the establishment of free technical and trade schools, for example, it is doubtless true that greater and more beneficent results might be accomplished, but when much of it goes into unendowed and often unequipped buildings which can only be maintained by calling upon alumni and friends for aid, or by raising tuition and other fees, we can understand why many colleges are property poor and constantly begging. The building of great dormitories often makes sharper the lines of social cleavage in the student body, places a premium on wealth, encourages luxury and ostentation, and makes life the harder for the poor and self-respecting student, and money expended for building gorgeous chapels, great gymnasiums, magnificent dining-halls and the like is generally misapplied and productive of few good results. Even great library buildings and museums are often useless duplications, the maintaining of which makes large drafts upon income, and they may be of little direct benefit to the undergraduate student, and none at all to the advanced worker for whose needs they may be quite insufficient. These external and material things, often imposing, even magnificent in themselves, contribute little in any direct way to the legitimate educational work of an institution, and they often limit its activities and interfere with its real usefulness. Theirs is a fictitious value, largely sentimental, but the cost of maintaining them is great, and in this do we find further explanation of the fact that our largest and richest educational institutions are most expensive to their patrons. Nor can much satisfaction be obtained from a consideration of the claim that in many of our larger colleges opportunities in the way of scholarships are open to able and deserving students, because it is not so much the poor man of brilliant parts, able to secure these prizes, that needs aid and encouragement, as the man who is both poor and of average ability. He it is who most needs aid and for him more should be done. There is danger that the conditions in some of our endowed eastern universities may in the not far distant future come to resemble those existing at Oxford and Cambridge. Bishop Gore in the House of Lords has recently denied that these universities are training the "governing classes." "The working classes," he asserts, "are beginning to govern the kingdom, and they are excluded from universities which are playgrounds for the sons of the wealthy, the majority of them idlers." The influx of foreign students at Oxford, due to the establishment of the Rhodes scholarships, has shown the insufficiency of much of its machinery for latter-day needs, and in America we shall be losers and not gainers if through mistaken sentiment we copy the imperfections of English universities instead of aiming to develop a type natural to our soil, adapted to our needs and in keeping with our institutions and social system. Chancellor MacCracken, in an

address to teachers and students of the summer school of the New York University last month, said:

> More than one university to-day is in great danger of being misunderstood. A few "trust magnates" are giving to certain universities millions of dollars. These universities are in danger of being reckoned the purchased servants of a narrow caste. The sure and efficient way to escape this suspicion is for the universities to rid themselves of idle undergraduates who make no end of trouble, and to devote their money and energy to giving instruction and inspiration to the public teachers throughout the land. In a word, let the university cease to serve so largely the unproductive few and rather serve the productive and industrious many.

In referring as I have to the misuse of moneys given to education, and in the few words that I shall add in taking leave of this topic, it has been far from my intention to imply that money is not needed in educational work. It is, and vastly more than has yet been given, or provided by any state, might be well applied, but my desire has been to emphasize the fact that large real estate holdings, costly buildings and even great collections in science, literature and art, are merely external things which may, or may not be, advantageously and economically employed, and should be regarded as means and not as ends in themselves, since they may be entirely unproductive unless wisely used, and even their possession may, by establishing false standards, restricting competition and in other ways, work harm rather than good. In a country like ours higher education should be in no way dependent upon the variable and perhaps ill-directed impulses of individuals, however generous and philanthropic they may be, but like our public school system, which is our pride and great privilege, makes valuable to us our political rights, and is the chief conservator of our national well-being, it should be, and doubtless in time will be, administered by the state for all the people. Following the lead of western states, we shall have great universities, of wider scope and greater size than any now existing, where instruction in all departments of learning will be given to all who are competent to avail themselves of the advantages offered and are desirous of embracing them. Can public funds be better expended than in the education of the people, and if the revenue of the state was largely increased by proper taxation as of incomes, increased graduated inheritance taxes, and larger taxes upon stock-transfers, public franchises and many luxuries, the cost of higher education for the people would not be felt. I shall not stop to answer the objections of those who entertain the time-dishonored notion that public education is a form of charity, and that it is no part of the duty of the state to bring higher education to the masses, since the principle, well enunciated by the late President Harper at one of our university convocations in this city not many years since, that a municipality has right to teach anything in its schools that its voters are willing to tax themselves to pay for, is seldom any longer denied. At its last session the Wisconsin legislature passed a law authorizing cities in that state to raise funds by tax for the establishment of trade schools, and similar and even more comprehensive action bids fair soon to be taken in other states. If the east does not follow the west in establishing, and liberally maintaining, state universities we have reason to fear that our smaller colleges and professional schools will be overshadowed and ultimately extinguished by the larger institutions which receive the great benefactions. Professor Lowell, of Harvard, in an address delivered at Yale last April, shows that "a young man can go to-day more cheaply to a state university in another state that charges a differential fee,

than to one of the eastern colleges." If the cost of attending our private and endowed institutions is to go on increasing the result inevitably will be that the larger and richer these become the more inaccessible will they be to the poor student who has greatest need of such advantages as they offer. I return to and emphasize this point because it is not a theoretical criticism, but an obvious fact. Our smaller colleges deserve and should receive fuller recognition and better support. Unless this is accorded them they are sure to suffer and the people to be the losers, but the ills resulting from the increasing cost of higher education may doubtless best be relieved by the state and in the manner indicated. The old objection to all this that we have doctors and lawyers enough but need more working people and servants, has been answered too often to need notice now. The law of supply and demand will take care of all that and, in any event, no social order can be lasting which seeks to perpetuate itself by keeping a part of the people down.

But another reason aside from general expediency why the state should undertake the duty of providing technical and higher education for the people may conveniently be stated now. During recent years the state has assumed the right to regulate many industries and most of the professions in the public interest. In so doing it has incurred consequent responsibilities. Industrial independence is now held in check by state control, and at no time has the disposition to regulate trades and control corporations been so marked as at the present. And so with the professions also. The regulation of the practise of medicine amounts in most states to absolute control. The state sets the educational standard for the student entering the medical school, and it fixes the length and character of the course which he must pursue, and after his graduation requires him to give evidence of his competency by passing an examination before it confers upon him by license the right to practise medicine. Infractions or evasions of the medical laws are punishable by severe penalties and the control exercised by the state over the practitioner of medicine from the day of his entering into the ranks as a student is supreme. But, in raising the standard and regulating the practise of medicine the state has assumed new responsibilities and the time is not far distant when it will be recognized as its obvious duty to make adequate provision for the education of its people, not in medicine alone, but in all the professions and many other occupations which it regulates, or in which it has established standards. This need in no way interfere with private institutions any more than our public schools interfere with private academies at present. If the result of the establishment by the state of high standards in medicine, for instance, is to increase the cost of medical education so that the doors of the schools must be closed to many, then the duty of the state to make provision for the education of such is apparent. And this condition is approaching. That many schools of good standing and entire respectability continue to carry on their work, as in the past, through the income derived chiefly from tuition fees is true, but it will be found upon investigation that these schools are possessed of certain advantages, as of position, established reputation, or exemption from certain present restrictions, which account for their continued existence. We are told by some educational experts that it should cost the medical school three or four times as much to educate a student as it can reasonably demand from him in fees. In other words it amounts to this—that no body of

men having secured a charter in this state, for example, could provide the money to erect and equip a medical school which should comply with the requirements of law, and carry on therein the work of medical education at a profit. Indeed a very large balance on the wrong side of the ledger must soon be shown if running expenses and interest on cost of plant is to be paid, and the school is to compete with other established schools. If this be true it must be evident that ordinary business enterprise can not be depended upon to establish and maintain medical schools, and that the work of medical education must sooner or later be done either by private institutions enriched by wealthy benefactors, or in universities established and maintained by the state. We are in a period of rapid change. For a time the old order will suffice, but it can not be for long. Some of us view these impending changes with anxious uncertainty; others with apathetic indifference, and others still see in the progressive movement that is taking place the promise of the satisfactory solution of a perplexing problem. For myself I can not for a moment doubt that when the time comes for the people to decide whether the avenues that lead to professions like ours are to be kept open and safe-guarded to all the people, or whether they are to be narrowed by private control, or maintained by the self-sacrifice or generosity of individuals, they will speak with no uncertain voice.

And now before we take leave of this subject may I indicate some present tendencies which to my thinking need to be restrained, and which if not checked may result in the evolution of such a cumbersome and mechanical system of medical education and licensure as may threaten its overthrow, and in what I shall say, as also in all that has been said, excepting only in the words of welcome with which as a representative of the faculty I have greeted you, I give expression to individual opinions and am not speaking for my associates, so that if there be error or fault in anything said the blame is mine alone and should be imputed in no degree to any other. It behooves us, I think, to remember that our licensing boards are creatures of the state and that our whole educational system is subject to the will of the people and is not controlled by educators, specialists and salaried officials. Those who favor reasonable state control will therefore not urge reform of too radical a nature lest what has been gained be placed in jeopardy. In the state of Minnesota last winter so insistent a demand was made in the legislature for the opening of the state university to all applicants without regard to preliminary training that the project, though subversive and ill-advised, had to be considered and a compromise effected. Conditions in the east are different, but if the policy of certain extremists, who are influential at present in our state and national associations, is adopted, opposition will be aroused which may precipitate a reaction. Those who favor higher standards and extreme state control base many of their arguments upon doubtful premises. I am sometimes inclined, for example, to disagree with those who hold that since the adoption of a preliminary education requirement by law in this state an improvement has been effected in the class of men entering the medical schools. Men who spell wretchedly and make bad work with simple arithmetical calculations still enter, armed with state credentials, and last year in this school more first-year men were conditioned than in any previous year within my recollection. Nor am I inclined to believe that the average reputable American physician to-day is in any recognizable de-

gree superior to his predecessor of a quarter century ago *as a result* of state supervision. State control may eliminate ignoramuses and charlatans, although in many states the laws are so framed as to apply to physicians of established schools of practise while irregulars of many kinds and "healers" are exempted from their provisions, but however effectual they may be as restrictive measures laws are much less effective in elevating the people in any direction than many enthusiasts would have us believe. The educational systems in European countries where bureaucratic methods prevail do not always produce the most enlightened citizenship, and in a democracy institutions thrive best if the people are not governed too much. I think that our medical schools themselves may be trusted in greater measure to bring about needed reforms and advance medical interests than some noisy reformers who clamor for more and more stringent laws seem to suppose. It seems to me to be time that the medical profession asserted its dignity once more and resented the imputation that so large a number of its members are incompetent or unworthy that the public needs further protection by special legislation. Whatever others may think I shall not hesitate to raise my voice in opposition to such utterances as the following. Says the *Journal of the American Medical Association* in its issue of September 14, in the leading editorial:

> Stronger safeguards should be placed about admission to medical practise in many of the states. The examining boards should be given supervision of all medical colleges within their respective states, with authority to pass on the entrance requirements of prospective medical students and to issue or to have issued to medical students entrance certificates. They should have the right to inspect the medical colleges and to close such as are not sufficiently equipped or are not doing satisfactory work. . . . Without this right the boards are not in position to protect the public from incompetent physicians.

And this is the utterance of a journal which is supposed to represent the profession of the United States, but which, under its present management, is, in the opinion of some, representative of commercialism in medicine in a preeminent degree. It floods the mails with circulars urging graduates of the schools against whom it brings this general charge of incompetency to ally themselves with the association and to subscribe for the journal, and it solicits the advertisements of the colleges with unwearying persistence. In the issue in which this editorial appears I find the advertisements of no less than ten medical schools which, according to its own statistical tables published in its issue of May 25, ranked in the lowest class as judged by the percentage of failures of their graduates before state examining boards during the year 1906. Now I do not hesitate to say that in my opinion there is not an examining board in any state in the union which could safely be invested with such authority as the *Journal* recommends. In our own state, for example, this board is so constituted that although eighty-five per cent. of the physicians in the state are "regulars" they are represented by but four members upon a board of nine. In many of our states men of only average ability and capacity are drawing salaries and exercising a little brief authority under the laws in places often secured through political influence. What shall be thought of a proposal to place the medical schools of this country under their absolute control. We have been shamefaced too long, fearing perhaps that if we in the schools raised our voices in protest against these insistent demands it might be thought that we feared investigation or opposed reasonable and proper supervision. Such is not the fact, but silence may be construed at times into an admission of

guilt and it is high time that we resented the implication that the medical schools of this country are, as a class, unmindful of their high responsibilities and are employing questionable methods in the conduct of their work. There are poor medical schools as there are poor schools of all kinds, but no general charge of incompetency or dishonesty can lie against them as a class, and we should no longer remain silent when such charges are either directly or impliedly made.

Now first of all it seems to me we must guard against anything that savors of trades-unionism in medicine. Physicians should be banded together that they may promote the interests of their profession in proper ways, but any action that looks like closing the doors, or putting up the bars, for the purpose of lessening the number of medical men, and restricting competition, ought not to be tolerated. We are often told that the number of physicians in the United States is out of all proportion to the population and greatly exceeds that in any other country, but this fact in itself has no particular significance and may be cause for thankfulness. Conditions are different. If these practitioners are competent, and can make a living, let us not complain but rather thank God that the American people are better supplied in this respect, as in so many others, than those of Russia, or even France, Germany or England. With those who start with the assumption that our social system needs to be conformed to the European or monarchical type I have no argument, but there is danger that well-disposed and entirely patriotic persons, who are possessed with a zeal for reform and advance which is not tempered by a wise discretion, will by much fussing and compiling of statistics and the everlasting iteration of certain ideas bring about changes which will not be betterments. Such are the people who would reduce everything to a strict numerical expression. They pursue their investigations with a foot-rule and hour-glass, place implicit faith in statistics, and would reduce all to a system. They would determine the competency of a student to enter upon the study of medicine by the special courses he has taken, and the hours devoted to each, and whether his work is to be counted or not is to be decided by a measurement of floor-spaces of the recitation rooms and laboratories in which he has been instructed, and the cash value of the apparatus employed. They would measure his subsequent progress by mathematical computations in which the factors are forty or fifty divisions of the medical curriculum, each subdivided into lectures, recitations, clinics, demonstrations and laboratory work, and the value of each determined by a laborious conversion of these into hours, which must be so apportioned as to preserve a certain ratio, and the sum total of which must not fall below a prescribed minimum. And whether this instruction which he has received has been good or bad is to be determined by a consideration of the population of the place in which the medical school is situated, the value of buildings and apparatus, the ratio of students to floor areas, the number of cases treated in affiliated hospitals and dispensaries, and other such data. This is not fanciful. No month goes by that we are not requested to supply such information as this to individuals who are preparing papers to read at society meetings and conferences, to committees and councils of societies, and to state examining and licensing boards. These tiresome statisticians, with their arbitrary standards and mathematical deductions, seem to be in the ascendancy at present, but their enthusiasm needs to be restrained and saner views will

ultimately prevail. Their information is often inexact because it is voluntarily and often carelessly given; their methods of computation are faulty, and their conclusions therefore unreliable. Their method takes no account of the past record and acknowledged reputation of institutions, of the experience, devotion and ability of teachers, and other elements the value of which is not determinable by the quantitative methods in which they so much delight, and in the case of the student it has no way of measuring natural aptitude, quickness of perception and the zeal which is often born of necessity. For myself I do not believe that either institutions or individuals can be measured up in this mechanical manner, and I do not think that such methods will be tolerated if they ever come to be rigorously applied in determining the standing of colleges and passing upon their credentials. It is not denied that great differences exist in the quality of the work done in the medical schools of this country, but I am clearly of opinion that the present tendency is to attach altogether too much importance to the institutions in which a man's education has been obtained. Do we not need to change our thinking in many respects? Institutions do not make men. They only aid a little in their development and the things which we have taught ourselves are the most valuable to us in the real work of life. "They do most by books," says Sir Thomas Browne in his "Christian Morals," "who could do much without them, and he that chiefly owes himself unto himself is the substantial man," and Darwin has said with greater deliberation and more seriously, and I beg you well to weigh his carefully chosen words, "I am inclined to agree with Francis Galton in believing that education and environment produce only a small effect on the mind of any one and that most of our qualities are innate." Manners are the result of, and much of our behavior is influenced by, education and environment, but our qualities are born in us and training has little effect upon the mind. Hence the mistake in attaching too much importance to time spent, and courses pursued, in institutions, and there is great danger that our laws regulating the practise of medicine and other callings may be patterned after too narrow, inelastic and mechanical a model and serve to restrain rather than encourage the development of the vocations they control.

Another tendency needing restraint is exhibited by certain specialists and faddists who urge upon colleges the necessity for giving instruction in all sorts of special subjects more or less closely related to medicine. Lest I give offense to some of these enthusiastic propagandists who push their projects with energy worthy of more important causes, I will make no catalogue of them. These zealous advocates read papers at society meetings; interrogate the colleges in tones implying that they are guilty of wilful neglect in failing to include their fondly cherished fads in their curriculums; and they organize societies and write books on their specialties. Unfortunately they take no account of the demands now made upon medical students and the relatively small importance of their particular branches, and they overlook the fact that such subjects as they would have taught in systematic courses are either already included in other departments, or else are of such a nature that the physician who has need of special knowledge concerning them can easily secure it for himself when the want is felt. Unless the colleges resist this kind of pressure from without that is brought to bear upon them either their courses must be

lengthened or essential subjects must be curtailed.

We may indeed go further than this and say that the disposition to add anything to the present medical course which will necessitate lengthening it is a tendency that needs to be restrained. Unless the schools are to adopt an impracticable standard for which certain idealists seem to be contending, we may well be satisfied with the present four-year course. No one can deny the great advances which have been made within recent years, but is it not idle to suppose that educational courses can ever be made theoretically perfect and complete? Let us abandon the notion that the whole field should be covered in the medical course, and recognize the fact that as knowledge advances, and specialization increases, the ability of the individual to master the whole diminishes, so that the first and evident duty of the medical school should be to teach essential fundamentals and well-established principles, and leave many specialties, and most of the subjects which are still debatable, to be treated in optional courses or in other institutions.

And to my thinking it is no less true that the time spent in preparatory work is often much too long. The favored pupil who leaves the high school or academy at eighteen, college at twenty-two, and the medical school at twenty-six, if he takes a year or two of hospital or other post-graduate work, or studies abroad, will hardly be able to begin his practise until he is approaching thirty. This is quite too long a preparation. The man who has nothing to do, and plenty to do it with, may spend his time thus if he so chooses and no one be the worse perhaps, but the average man can not afford it, few men need it, and many men are injured by it. Doubtless some men mature less rapidly than others and need to be kept under tutors and guardians longer, but no educational system should be planned to meet the needs of the weaklings or the demands of idlers. Montaigne in his essay on "Age" says:

> I esteem that our souls show at twenty years of age what they mean to be. No soul that has not by that time given evidence of its strength will give proof of it afterwards. The qualities and natural virtues produce in that time or never what they have of vigor and beauty. It is possible that with those who occupy their time well science and experience may increase with life, but vivacity, promptitude and firmness, and other more important essential faculties, will fade and deteriorate. Therefore I complain of our laws; not that they leave us too long to our work, but that they do not employ us earlier; for considering the frailty of our life and the many ordinary accidents to which it is exposed I complain that so large a portion should be given up to childhood, to idleness and to apprenticeship.

If that was sound doctrine in the sixteenth century it is even sounder in the twentieth and needs restatement. Too much time is wasted in preparatory schools and colleges, but if these things can not be remedied then, to my thinking, the prospective medical student will do well to go from the high school directly to the medical college, or spend at the most not more than two years in intermediate work, which he may well devote chiefly to physics, chemistry, biology and modern languages. The old-fashioned college course is of little service to the student of medicine, and the time spent in pursuing it is frequently worse than wasted. The habits and associations which are formed are too often distinctly detrimental, and that four of the most valuable years in a man's life should be given over, as often they are, to aimless study, boyish frivolity and the formation of ideals which must be abandoned, and of habits which must be corrected in after life, is indeed deplorable. The youth who at eighteen or nineteen is without plans for the future and is carried along by in-

dulgent parents through a four-year course in college is little likely to be the better for it. If young men are to be sent to educational institutions for the purpose of increasing their social connections, winning laurels in athletics, touring the country in glee-clubs, or acquiring a superficial polish often referred to as culture, let the fact be admitted, but let us cease calling the experience thus obtained education. That a man should be at pains to learn much that later he ought to forget if he have due regard to his soul's health is disheartening indeed, but too often true of those who, without real disposition to learn, are yet engaged ostensibly in study.

But we must leave these general considerations and in so doing let me say that my object in discussing with you some of these educational problems has been neither to prejudice your minds nor to urge upon you the acceptance of my own views, but rather to incite you to investigate for yourselves and form your own conclusions. Do not accept standards and entertain opinions simply because they seem to be held by those about you. All real reforms have been brought about by discontented people —not by the conservatives and self-satisfied people, but by the radicals who go to the root of matters and do not judge by the stalk or even the flower alone. In every community a certain number of prominent people desire, from motives of self-interest, to maintain unchanged the present order, but the larger part are inert and take their opinions ready-made from others. These would not willingly injure their fellow-men but they are satisfied to drift with the current, and feel it to be no part of their duty to inquire whether the multitude are as fortunate and as well rewarded as themselves. Better far is it for us and for others if we think for ourselves, give expression to honest convictions, unrestrained by considerations of policy or temporary expediency, and when called upon to act, do so with the courage and decision which real convictions should impart.

And now will you allow me to add some words of advice and general counsel more particularly addressed to those who to-day make formal beginning of their medical study. You are entering, gentlemen, by different paths the portals which give you access to a noble profession. Do you recognize your responsibilities? If so the realization of them must of necessity affect your behavior and influence your lives. You are no longer boys, but men, associates and coworkers with your instructors, many of whom perhaps some of you will outrun in the race. Time will tell. See that you start aright. Do not think that your course is divided up into periods, some of which are preparatory or probationary, and admit of idleness and dissipation. You could not make a greater mistake, for it is not so. You are in the profession now. Claim all things to which you are entitled and act as befits men who have adopted a high calling. I beg you to listen to me when I say that you can make no greater mistake at the outset in your course than to attempt to inject into the medical school any of the boyish frivolities or foolish customs that obtain and may even be encouraged in high schools and colleges. Put all such things behind you, for they have no place here. If you have not "been to college" do not, I beg of you, suppose that the medical school in some way is to supply an imaginary lack. Don't call yourself a "freshman." We have no "freshmen" here. Don't do the foolish things that many college students do because you are in a "college." Many of these things are bad enough even in the places where usage has in a sense sanctioned them, but they are entirely out of place in a professional

school, and actions which might be condoned on a college campus become, if transferred to a medical school, merely disorderly acts, the perpetrators of which render themselves not only nuisances but liable to arrest for breach of the peace. I can not put this matter too strongly, and yet I do not wish to lay down any particular rules to govern your future conduct here. The whole matter lies in a nutshell. You are men, and have come here to associate yourselves with men engaged in the pursuit of knowledge whose desire it is to assist you in your work. They assume that your habits are fairly well formed, and that you are competent to enter upon the work which you have undertaken. They are willing to counsel and aid you, as friend may aid friend, but they do not desire to take the place of parent or guardian, and do not think that they should be held in any way responsible for your deportment. They stand upon no exalted pedestals and are neither omniscient nor oracular in their deliverances, and they expect from you only the courtesy which they are ready to render to you. That you are medical students then imposes new responsibilities and confers new dignities, but gives no license to disregard the ordinary rules of behavior which need no formal statement among gentlemen. Should there be any one here who has not appreciated this fact before and who is beginning his course under a misapprehension I beg him to revise his thinking that he may see things in their right relations to-day. The medical school is no place for boys and boyishness, and the medical student of to-day should no more conform to the Bob Sawyer type than our trained nurses do to those of the Sarah Gamp pattern.

Now this does not mean that there should be no relaxation at proper times, nor that all manifestations of class feeling and college spirit are necessarily out of place. Men who are closely associated for considerable periods of time naturally form attachments and such association engenders a kind of *esprit de corps,* but among men this should not find expression in boyish acts, and when it is manifested in buffoonery, lawlessness and physical conflicts the perpetrators of such acts become troublesome and disturbing elements. Our colleges are responsible for much of this lawlessness, for they too frequently condone where they should condemn, and they have been slow to reprove much which they might well have repressed, but from the man who has entered the professional school better things are expected, and if he falls short in his behavior he will find no indulgent apologists to hold him blameless.

Now, it may not seem very gracious in me to take advantage of the opportunity which this occasion presents to utter either warnings or complaints in seeming advance of any need of them, but the sincerity of the interest which I feel in your welfare prompts me to this frank speaking. Too many men who began their course with us last year made utter failure and find themselves again at the starting point, and for this reason, I believe, that they entirely misunderstood their position here. If I can save any one man from such lamentable failure I shall feel well satisfied to have put plain speaking in place of pleasant phrases and meaningless generalities. I can hardly suppose any one of you to be so short-sighted, but if any one is here to please parents or friends, to pass the time, or to secure an ornamental degree, he will find himself out of his element in such a school as this. Assuming, however, that you are here with good reason and honest purpose, what can be more evident than that you should cooperate with your teachers in all ways that you may secure to yourselves the

largest possible return for the time and the money which you are investing. If you slight your work, evade or seek to be excused from it, is it not evident that you are injuring only yourself? This would seem to be the merest commonplace, but it is far from being recognized by all. Men come here from schools and colleges, and they do not always realize that inherent conditions are different. In the college course the man whose only ambition is to get through and secure a degree can save himself trouble by selecting easy subjects where he has choice, by slighting his work to the point of maintaining a bare passing stand, or by dint of cramming, cribbing and faking he may secure his ends and, in a sense, get the better of his instructors. But in a medical school it is not so. There are, and can be, no equivalents and electives, no purely disciplinary or culture studies, and there should be no superfluities. Every subject is connected with some other and all are essential. Perfection is not expected, and it is not denied that some matters may be sacrificed or slighted and one's standing maintained, but none the less it is true that just in so far as work is neglected the delinquent is a loser, and if any one is cheated he is the sufferer.

Another thing I think ought to be said. You will find the work here harder probably than any you have done before. You will need to devote to it more hours a day than you have ever probably given to study in any other institution. Some advisers would therefore caution you as to the care of your health and the dangers resulting from a too strenuous application, but these are more imaginary than real, and I shall give you no such caution. I have known many men injured by too much exercise and harmed by too much recreation, but I can recall no instance, in my own personal experience, of injury resulting from too much study. I do not deny the possibility, but I consider the probability so remote that words of caution are uncalled for. Such exercise as you need you can secure in simple and inexpensive ways. Leave out-door sports for the present to those who have leisure for such diversions, for you have other things to do and will have little time to give to them. School teachers, clergymen, studiously disposed persons generally, who lead sedentary lives, ordinarily enjoy the best health, and the risks and dangers to which the medical man is exposed do not result from over-study or too close confinement, and even if they did, remember that the mere preservation of health and prolongation of life are not the highest conceivable aims, and that these considerations may be, and often are, disregarded with advantage. Intellectual growth and spiritual supremacy are more important than muscular development and physical superiority, and while the sound mind in the sound body may be the ideal toward which we should strive, if either must suffer let it not be the mind.

Gentlemen, you are prosecuting your medical studies at a propitious and in a momentous time. The science of medicine is making great, and is probably destined to make still greater, advances. The place you have chosen for your study is favorably situated and Albany is doing her part in the advance movement, to the progress of which you may have opportunity to contribute. Its importance and influence as a medical center is daily increasing. Its hospitals are of the best, its laboratories well manned and productive, and this old school is entirely in sympathy with the modern trend in the development of the medical sciences, and is employing modern methods in its work of teaching. Its graduates rank high in the profession, and occupy important and conspicuous places in the

community. A high standard has here been established and it will be maintained. What more need I say than that we welcome you to our ranks, pledge you our aid and urge you to improve every opportunity offered you for gaining knowledge of the profession to which you have devoted your lives. May this day be an auspicious one to you all, full of encouragement to those who return after a season of rest to the prosecution of their studies, and presaging success to those who, with honest purpose and entire devotion claim entrance to the ranks. On behalf of the faculty I greet you once again and bid you cordial welcome to this place.

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AMERICAN CHEMICAL RESEARCH[1]

IT is no disparagement to say that there are few chemists whose research work, at any given time, is of vivid interest to all classes of their chemical colleagues. To address an assembly of this kind on the experimental results of another man, to which results one has nothing of one's own to contribute, is to lay oneself open to a cross-fire—one part of the audience will ask why the speaker did not select a subject of which he had an adequate knowledge, whereas the other part will enquire why he did not deal with something that was *really* interesting. I have protected myself against both lines of attack by choosing a very large topic. I am confident that, intrinsically, it is interesting to each of us, because we all read our own papers and occasionally the publications of our friends, especially if we believe them to be erroneous, or think that they are going to interfere with our particular results!

During the past three years I have had the sole active charge of the *American Chemical Journal*, and I propose to take its history as the basis of my remarks. I select it simply because of my familiarity with it; the subject could be equally well illustrated by our own *Journal* and, so far as its age permits, by the *Journal of Physical Chemistry*. The first number of the *American Chemical Journal* is dated April, 1879. Volume 1 (1879–80) contains 460 pages. Volumes 10 and 20 (1898) comprise 472 and 890 pages, respectively. After that year two volumes were issued annually, the last one, number 37 (January to June, 1907), includes about 650 pages. To put it in another way, at the end of ten years the quantity of published matter per annum was the same as at the end of the first year; at the end of the twentieth year it had doubled, and eight years later it was three times greater than during the tenth year. An inspection of the earlier volumes suggests many reflections concerning the almost complete change which has taken place in the names of contributors during the past twenty-eight years. I shall not indulge in these beyond saying that death accounts for only a few of them. I feel sure, however, that you would not wish me to pass in silence over the fact that of the earlier contributors, practically only three, Professors Arthur Michael, H. N. Morse and W. A. Noyes, continue to contribute, at the present time, as successfully and copiously as ever to the extension of scientific knowledge.

Returning now to the consideration of the enormous increase of published matter, especially during the past fifteen years, the question arises, To what is it due? Undoubtedly the amount of scientific research carried out in this country is greater, both relatively and absolutely, and a comparison of the papers published in American chemical journals with those appearing

[1] Address delivered before the American Chemical Society at the Toronto meeting, June 28, 1907.

in other countries will show, beyond question, that on the average the home product is fully equal in quality to the foreign output. Although we may be satisfied on this point, yet it is certain that very much more might be done if an extra effort were made by the many whose training has taught them something of the methods of research, and this extra effort would not fail of its speedy reward.

A second most potent factor in increasing the quantity of work published in this country is undoubtedly due to the fact that, until comparatively few years ago, much if not most of the results of the best work done here was published abroad. At present not more than two or three people of any importance in the chemical world habitually send their results to Europe, yet some who should know better often communicate preliminary papers, or short articles containing the cream of their results to foreign journals. When, as sometimes happens, this is done essentially to secure duplicate publication, it is, of course, inexcusable, and even when the motives are unexceptionable the practise is one that should be indulged in sparingly, because it simply encourages the highly conceited and very prevalent German habit of ignoring or belittling American chemistry. Further, we must remember that if *we,* without detriment, can *now* publish our results at home, it is because of the patriotism and self-sacrifice of men like Professors Edgar F. Smith and W. A. Noyes, who, in the darkest days of our society, deliberately published some of their most important papers in its *Journal,* and thus compelled serious foreign recognition of it. It is the results of their devotion which we are now enjoying.

Leaving this matter of publication, I wish to direct your attention to another phase of the subject. Many persons have the *name* of research on their lips, but the *thing* itself is far from their minds. This is true of the college president who "encourages research" by giving an unfortunate teacher a couple of free hours per week, loading him down with numerous courses of instruction and with faculty work, and then wondering why published results are not forthcoming! The greatest sinners in this respect are probably our technical brethren. All of us are familiar with the man who gives an address and, after telling us of the vast importance of his industry, proceeds to formulate a series of questions regarding the behavior of leather, coke, tar, paper, etc., or the materials from which they are made, winding up with the suggestion that *somebody* in search of a problem should attack the subject. The speaker then complacently wends his way home, evidently feeling that he has done his part towards the advancement of research. Of course, what he has done is to demonstrate, in the clearest manner possible, his own complete innocence of the slightest conception of what scientific research really is and under what conditions it is carried out. It is safe to say that everybody who is capable of independent investigation is overcrowded with problems of his own; what he requires is time and help to investigate them. Those who lack the problems also lack the ability to attack them successfully without detailed and continuous help. In this country probably not more than a score of men are paid directly for doing research in chemistry; the remainder carry out their investigations at very great personal sacrifices of time, energy and money and, consequently, their absolute right to select their subject with perfect freedom is beyond question. If I meet my technological friend on his way to the golf links and tell him of the large load of wood which I want split, pointing out that it will afford him admirable exercise besides being *useful*

to *me*, I fear that he will suggest that I split it myself or pay somebody else to do so, he, for his part, preferring to spend his well-earned hour of liberty in his own way without reference to my desires or convenience. Frankly, technical men must follow the practise of the best firms and bear the cost of their own research.

As my editorial work is at an end, I shall conclude this address with a few remarks concerning the difficulties which are encountered in such a position. Some little time ago a friend who edits and partly owns a scientific (non-chemical) journal, urged upon me the view that, essentially, an editor's duties should be confined to proof reading. That manuscripts should be printed exactly as sent in and that an author should be allowed the utmost liberty to make any exhibition of himself that he might choose. The prospect to an overworked assistant editor was very tempting, but, of course, the answer is that most journals profess to be published for the readers rather than for the authors. It is strange that a man will spend months or years working hard at a problem and will then neglect the few minutes required to verify the spelling of proper names (and occasionally of others), to place punctuation marks, or give his references in accord with the system adopted by the journal to which he is contributing. Some authors appear to be incapable of checking up their empirical formulæ or their analytical results, others show a preference for quinquivalent carbon atoms, whereas some appear to bend their energies to the reproduction of the graphic formulæ of such complicated compounds as methane or carbon dioxide, which latter they may write as one word. All this, like blots and smudges, which of course the printer will try to set up, is due to carelessness. On the whole, the standard of English is fairly good, of necessity one meets with "shall" and "will" misplaced, with "gotten" and "proven," with "glas" and "gass," while some of those who have spent a few months in Germany naturally forget their native language for the remainder of their lives and spell hydriodic acid and quinone according to the Teutonic fashion. The facts that, in English, the names of alcohols end in *ol*, those of amines in *ine* and that amino acids and amides are *not* identical appear to be beyond the limits of knowledge of some contributors. In general the meaning of an author is fairly clear, but occasionally some very startling statements are made, as, for example, one by a chemist of considerable prominence, who said, of a liquid, that it "heaped up about 150°." Another man, almost equally well known, describes a number of solids, all of which "melt under decomposition," whatever that may mean. These remarkable materials should certainly find place in the National Museum!

The really important point about such errors is this: Scientific workers in general and, I am sorry to say, American scientific workers in particular, have a bad reputation for the form in which their results are presented. In the vast majority of cases this reputation is not deserved, nevertheless the many suffer for the sins of the few. Authors should remember that the simple act of publication constitutes, in itself, an invitation to the world to give due credit and honor for the work which is described in their papers. A chemist is, presumably, not likely to underrate the value of his own work; if *he* does not consider it worthy of clear and accurate description, he has no right to expect that busy people will take the time and trouble to acquaint themselves with his results, no matter how important they may be.

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MATHEMATICAL PRODIGIES[1]

When scarcely three years old Gauss, according to an anecdote told by himself, followed mentally a calculation of his father's relative in regard to the wages of some workmen, who were to be paid for overtime in proportion to their regular wages, and, detecting a mistake in the amount, he called out "Father, the reckoning is wrong, it makes so much," naming the exact amount. The calculations were repeated and it turned out that the child was correct, while all who witnessed the performance were greatly surprised. He retained an extraordinary ability for mental calculations throughout life and remembered the first few decimals of the logarithms of all numbers, so that he was able to use the data of a logarithmic table in his mental calculations, and hence he possessed a mental slide rule—a unique possession.

Gauss was not only one of the greatest mental calculators on record, but he excelled equally in all branches of pure and applied mathematics. At the age of twenty he discovered the first rigorous proof of the fundamental theorem of algebra, which affirms that every algebraic equation has as many roots as its degree, and at the age of twenty-four he published his great work on the theory of numbers under the title "Disquisitiones Arithmeticæ." Later in life he turned his attention principally to applied mathematics—especially to astronomy and geodesy—and he is generally regarded as the last of the great mathematicians who was preeminent in nearly all branches of mathematical knowledge of his day. He considered mathematics the queen of the sciences and number theory the queen of mathematics.

While Gauss was both a great mental calculator and a great mathematician, and was a real mathematical prodigy, we proceed to consider several who were merely arithmetical prodigies and seemed to have very little general mathematical ability. The greatest of these is Dase, who was born at Hamburg in 1824, and "seems to have been little more than a human calculating machine, able to carry on enormous calculations in his head, but nearly incapable of understanding the principles of mathematics, and of very limited ability outside his chosen field." His extraordinary ability in mental calculation is evidenced by the fact that he was able to multiply mentally two numbers, each of which contained one hundred figures. It took him eight and three quarter hours to perform this feat, which stands in a class by itself, as no other arithmetical prodigy is known to have been able to multiply mentally two numbers each consisting of more than thirty-nine figures. Two forty-figure numbers, Dase was able to multiply mentally in forty minutes, while he would multiply two eight-figure numbers in less than one minute.

What is most surprising about this greatest mental calculator on record is that he was stupid in mathematics. Petersen is said to have tried in vain for six weeks to get the first elements of mathematics into his head, and other eminent mathematicians found that he had very little mathematical ability. Fortunately he was advised by some of the leading mathematicians of his day to turn his extraordinary ability to scientific uses instead of going around the country giving public exhibitions, a career upon which he had entered at the age of fifteen. He calculated many useful tables and was engaged on an extensive factor table at the time of his death. The ease and speed with which he could count the number of books

[1] Read before the Summer School students, University of Illinois, August 5, 1907.

in a case, the number of sheep in a herd, etc., was almost more surprising than his ability as a mental calculator.

Another well-known mental calculator, having even less mathematical ability than Dase, is Buxton, who remained illiterate through life, although his father had some education. He had a wonderful memory for numbers and could call off long numbers from right to left or from left to right with equal facility. On one occasion he squared mentally a thirty-nine-figure number in *two and a half months*. He was extremely slow and in this respect resembled a negro by the name of Tom Fuller who is known as the Virginia calculator. Although entirely illiterate he was able to reduce mentally years and months to seconds and could multiply two nine-figure numbers.

Darboux has called attention to an infant prodigy, of interest both because it relates to a man who afterwards became a very prominent mathematician and also because it is not included in the lists of mathematical prodigies which have recently appeared in this country.[2] Joseph Bertrand was born in Paris in 1822 and was such a delicate child that his parents did not expect him to arrive at manhood, and hence his early education was partly neglected. At the age of four he was sick for a long time and overheard the lessons which were given his brother in the same room. He knew the letters of the alphabet, but nothing more. When he was convalescent his parents brought him a book to look at the pictures, and he relates, in his account of his childhood, that he remembers distinctly how he shocked his parents by reading the text fluently. His frightened father snatched the book from him and commanded that under no pretext should he be allowed to do any work.

The manner in which he learnt elementary algebra and elementary geometry is still more extraordinary. We reproduce his own account:

> At the age of nine I had the great misfortune to lose my father, who, during the last part of his life, resided with my uncle who directed then a school preparing for l'École Polytechnique. The students, the youngest of whom was twice my age, loved me very much and I was very happy in their midst. I was assiduous at their recreations and often followed them to their classes. The teachers regarded me with astonishment but paid little attention to me. The students observed that I understood the work and when a demonstration appeared difficult, the first one who noticed me would run after me, take me up in his arms, and, placing me on a chair so that I could reach the blackboard, made me repeat the demonstration.

At the age of sixteen he entered l'École Polytechnique, and, as the examiner knew that he had already passed the examination for the doctor's degree in science, he gave him some very difficult questions. From one of the answers it appeared that Bertrand had never opened a table of logarithms. The examiner considered this answer an impertinence but gave him the highest grade. At l'École Polytechnique Bertrand says that he was a problem for his companions. He always received the highest grades but he was ignorant of some of the simplest things. For instance, he did not know what words were called adverbs, as he had never prepared a lesson in literature or in science and no teacher had ever asked him to make any calculation of any kind.

Bertrand's extraordinary youth gave rise to many marvelous stories. Fortunately, he wrote a brief account of his early life when he was elected in 1884 to

[2] Scripture, "Arithmetical Prodigies," *American Journal of Psychology*, Vol. IV. (1891), p. 1; Mitchell, "Mathematical Prodigies," *ibid.*, Vol. XVIII. (1907), p. 61. Bertrand was a mathematical prodigy, but he can not be classed among the arithmetical prodigies.

the French Academy. Hence we have a more reliable sketch of this infant prodigy than is possible to obtain in most other cases; for instance, in the case of his countryman, Pascal. The facts that Bertrand was permanent secretary of the Academy of Sciences for more than a quarter of a century, that he is the author of many theorems relating to modern mathematical subjects, and that he lived so recently, add interest to the account of his marvelous early education.

In the article already cited, which comes from the Psychological Seminary of Cornell University, Mitchell gives an interesting study of arithmetical prodigies and devotes considerable space to his own case. We add some of his conclusions.[3] "Mathematical precocity, then, stands in a class by itself, as a natural result of the simplicity and isolation of mental arithmetic. There is nothing wonderful or incredible about it. The all-round prodigy like Ampère or Sir William Rowan Hamilton or Macaulay is possible only in a well-to-do and cultured family, where books are at hand and general conditions are favorable, and he must possess genuine mental ability. The musical prodigy, again—Mozart is the stock instance—must come of a musical family, hear music, and have at least some chance to practise, and hence can not long hide his light under a bushel. But the mathematical prodigy requires neither the mental ability and cultured surroundings of the one nor the external aids of the other. He may be an all-round prodigy as were Gauss, Ampère and Safford, but he may also come of the humblest family, and be unable, even under the most favorable conditions, to develop average intelligence."

G. A. Miller

University of Illinois

[3] Page 39.

SCIENTIFIC BOOKS

THE HARVEY LECTURES FOR 1905–6

This volume consists of thirteen lectures given during the year to the Harvey Society of New York. This organization was founded in the spring of 1905, largely through the initiative of Professor Graham Lusk, for the diffusion of knowledge of the medical sciences by means of lectures given by authoritative research workers. The first volume constitutes a most valuable collection of first-hand information given by some of the most prominent investigators in this country and Europe and the reviewer finds before him an embarrassment of riches from which it is difficult to make a selection since all is good.

The first lecture by Professor Hans Meyer, of Vienna, is devoted to "The Theory of Narcosis" upon which subject no one is more competent to speak than this distinguished exponent of pharmacological research. So soon as scientific medicine began to break away from, or at least to seek, other support than blind empiricism, inquiry into the relation between the physiologic action of a drug and the physical and chemical properties began. One of the first investigations of this kind was carried out by Crum-Brown and Fraser, who discovered that practically all the organic bases in which the pentavalent nitrogen is connected by four of these valences with carbon have the same physiologic action notwithstanding other differences in their constitution and nature. The strong basic properties of these substances seem to be the determining factor in their effects upon the animal cell. Hofmeister and others pointed out that the laxative and diuretic effects of the neutral salts of the alkaline bases are due to their diffusibility and osmotic strength. The anesthetics include many substances that differ from one another chemically, while all depress the central nervous system. Meyer has made a careful study of the distribution coefficient of the narcotics between fatty and watery solutions and arrives at the following explanation of narcosis:

The narcotizing substance enters into a loose physico-chemical combination with the vitally im-

portant lipoids of the cell, perhaps with the lecithin, and in so doing changes their normal relationship to the other cell constituents, through which an inhibition of the entire cell chemism results. It also becomes evident that the narcosis immediately disappears as soon as the loose, reversible combination, which is dependent on the solution of the tension, breaks up. It follows further that substances chemically absolutely indifferent, as the volatile saturated hydrocarbons, can act as narcotics.

In the second lecture, Professor von Noorden states "the modern problems of metabolism" in his usually interesting style. Some of the statements in this lecture might be criticized, but the reviewer has no desire to be captious, and when he notices that nearly two years have passed since the lecture was given and probably all of that since it was prepared he is ready to admit that it is only just not to be too critical. The confusion of erepsin with the cellular proteolytic ferments would not be made now, and the fact that the circulating proteins are strictly specific for every species of animal seems to be abundantly demonstrated by biologic tests, which are much more delicate than chemical analyses in distinguishing between proteins. Professor von Noorden points out clearly that the greatest interest and importance are now attached to the study of the intermediary products of metabolism. If the protein molecule is wholly disrupted into amino-groups in the alimentary canal, are these all or in great part synthesized into body proteins or are they treated as waste, converted into urea and thrown into the sewer? Is the man who follows Voit's average and eats 118 grams of protein a day simply wasting his energy in the manufacture of amino-acids which serve neither bone, muscle nor brain, but only tax the liver and fatigue the kidney? These are some of the questions that are now puzzling the physiological chemist, but he is a lusty young fellow and will solve the riddle by and by.

Professor Novy speaks interestingly and somewhat at length "on trypanosomes." Probably no other branch of microbiology has been developed so rapidly as that of protozoology and no other promises more benefit to mankind. While the bacterial diseases predominate in temperate regions, the question of the development and the civilization of the tropics depends largely upon man's ability to destroy the protozoal parasites and the scientist must be the pioneer in this work. Novy's discovery of the methods of growing the trypanosomes in artificial cultures is a long step in the right direction. In 1841 Valentin reported the first of this large class of parasites in the blood of the salmon and a year later Gruby found a first cousin in the frog and proposed the generic name, *Trypanosoma*. During the sixth decade of the last century similar parasites were found in moles, rats and mice, but these findings were practically ignored until Lewis in 1877 made his classical contribution to the subject. Three years later Evans found a trypanosome in the blood of animals suffering from a disease afflicting horses and camels in India and known as surra. In 1894 Bruce began his studies of the tsetse-fly disease known in Zululand as nagana and demonstrated that it was due to a trypanosome which is transmitted from infected to healthy animals by the fly. This disease was observed by Livingstone and is widely distributed over middle and southern Africa, extending up the west coast to Senegambia and on the east to the Red Sea. It affects the horse, mule, donkey, dog, ox, cat and many wild animals. Indeed, the chief occupation of the tsetse-fly seems to be to transmit the trypanosome from wild to domesticated animals and in the horse, donkey and dog the disease is said to be invariably fatal. Moreover, the tsetse-fly seems to have a monopoly in this business, since it has been shown that infected animals may be kept in the midst of uninfected ones in regions where this fly does not exist. Two Togo ponies were found in the Berlin zoological gardens to be infected and notwithstanding the presence of other biting insects the disease was not transmitted to other animals in the gardens. In the wild animals of Africa this parasite is either wholly harmless or kills so slowly that the supply does not run out. Since the rinder-

pest has found its way among the game animals the fly disease has become less prevalent and in some localities has been reduced to a negligible quantity. This seems to be an instance of driving out the Devil with Beelzebub. The trypanosome of dourine was discovered by Rouget, a French army surgeon, in 1894, the same year that Bruce began his work on the tsetse-fly disease. Dourine is apparently transmitted only during the sexual act and for this reason the French know it as *mal du coit,* and in English it is sometimes designated as "horse syphilis." It is especially prevalent on the shores of the Mediterranean. Its presence in America has been frequently suspected and within the past few months it has apparently been demonstrated in the Canadian Northwest in imported stock. *Mal de caderas* is the only trypanosomatic disease known to be indigenous to the New World. It is prevalent in South America from the Amazon to Bolivia and is due to *T. equinum,* discovered in 1901 by Elmassian. It is most frequently found in horses, in which it causes a remittent fever leading to loss of weight and finally to paralysis of the hind quarters. It is to the last-mentioned symptom that the disease owes its name. The agent of transmission in this disease is not known. Gambian horse disease was first observed by Dutton and Todd in 1902 in the horses of Senegambia. It is not known to infect other animals and in the horse is much milder than nagana. The parasite exists in two forms, a short and a long, and is known as *T. dimorphon.* A trypanosomiasis, much milder in character than nagana, exists throughout southern Africa, is confined to cattle and is known as gall-sickness, or galziekte. Sleeping sickness has been known since Winterbottom wrote concerning it among the slaves in 1803. Hundreds of slaves with this disease were shipped to the western world, but there was no diffusion here because of the absence of the agent of transmission. It is now known that sleeping sickness is due to *T. gambiense* and that it is transmitted by a species of tsetse-fly different from that which disseminates nagana. It is said that hundreds of thousands of people have died in recent years in Uganda from this disease which is quite surely fatal.

In the fourth lecture Professor Levene discusses "Autolysis" in a most satisfactory way. It was once supposed that the disintegration of organic matter was wholly a process of oxidation and that in order to prevent decay it was necessary to exclude the air. On this erroneous principle a wise Frenchman taught the world how to can fruits and vegetables; so good came, as it often does, from reasoning founded on a false premise. Then Pasteur taught us that putrefaction is due to microorganisms and gave the true explanation of sterilization, but the generalization that the world drew from Pasteur's work was in part erroneous. We came to believe that absolutely no change takes place in organic matter if bacteria be excluded; but Hoppe-Seyler and Salkowski have demonstrated that animal tissue at least carries in itself ferments that under certain conditions disrupt its own protein molecules, breaking them down into smaller particles such as amino-acids. Moreover, the work of Schulze and his students has demonstrated that the seeds of plants contain three important substances, the embryo, a ferment and the stored food supply. In the presence of heat and moisture the ferment splits up the food material and the bodies resulting from this digestion begin to react on the constituents of the embryo and latent life is awakened into the active form. Levene has himself made important contributions to the problems of autolysis and consequently he speaks authoritatively and interestingly.

Professor Park tells of the "results of serum therapy in the diseases of man." The discovery of diphtheria antitoxin is one of the most brilliant and at the same time one of the most beneficent that the genius of man has accomplished. Your reviewer was fortunate enough to be present at a meeting of sanitarians in Budapest when Roux confirmed the observations of von Behring as to the curative value of diphtheria antitoxin and he well remembers the enthusiasm with which the announcement of Roux was greeted, and now

after thirteen years it must be said that the hopes then awakened have been more than realized. Thousands of lives have been saved and the once dreaded scourge of diphtheria has been robbed of its horrors. However, the dream that an antitoxin for each and every one of the infectious diseases would be secured within a few years has not developed into a reality and is not likely to do so. Indeed, it is possible that the attempt to work out an antitoxin for typhoid fever has delayed the discovery of the true method of treating that disease.

Professor Barker discourses on "the neurons," the theory of which has aroused much discussion and some bitterness of expression among histologists and it is all about the exact relation between the nerve cells and the nerve fibers. However, this is by no means a matter of trifling importance, because upon it rests problems not only of structure, but of function as well. The theory, founded largely upon the work of His, Forel and Cajal, was evolved by the genius of Waldeyer and it supposes that there is no nerve fiber independent of nerve cell and that the cell with all its prolongations is a unit or a neuron; that these units are not united to one another anatomically, but act together physiologically by contact; that the entire nervous system consists of superimposed neurons; that the neurons are so arranged that an impulse can pass only in one direction and starting in the dendrites it is carried to the cell body and thence along the axis cylinder to the dendrites of another neuron; that every part of the neuron is dependent for its nutrition on the nucleus of the cell body, and that when a nerve fiber is injured or severed the regeneration of the axis cylinder is accomplished by an outgrowth from the central end and in no other way. This theory has met with wide acceptance, but also with some strong opposition. The most vigorous opponents being Apathy, Bethe and Nissl; and Professor Barker, while supporting the theory is generous in his estimate of the value of the work done by these men. The lecture is most instructive and brings the whole subject up to date (January, 1906). The important work, illuminating this subject, done by Harrison is mentioned and has been more fully developed since.

Professor Lee discusses the old, but always interesting, subject of "fatigue." Why do we tire, is it in the nerve or the muscle, and what are the fatigue-producing substances? The nerve-muscle machine is a great invention, the first used by man, and still there are many things about it and its action that we do not understand. The scientific study of fatigue has been carried out largely by Mosso and his students and the ergograph in its improved form gives accurate results. The weight of evidence at present is that the nerve is not fatigued and that the tired sensation is due to peripheral exhaustion. However, the question in all its details can hardly be considered as finally settled. Hodge and others have demonstrated microscopical changes in certain nerve cells after muscular exertion and the experiments of Sherrington seem to show that in fatigue there must be something at fault in the nervous connections. He takes a spinal center which has several afferent tracts and but one efferent to a given muscle, and he finds that when he has exhausted the muscle by stimulation through one afferent nerve, it acts with renewed vigor when the stimulation is sent through another. The muscle, the motor nerve and the center are the same and renewed vigor is secured by sending the stimulation through another afferent. Sherrington thinks that the trouble lies at the point of contact between the afferent and efferent neurons. The fatiguing metabolism products are believed to be potassium acid phosphate, sarcolactic acid and carbonic acid. The statement of Weichardt that he had not only found a toxin that is responsible for fatigue, but had produced an antitoxin with which weary people might be treated, seems to have met with but little appreciation.

Professor Mandel points out the "recent advances in our knowledge of the formation of uric acid." It was formerly believed that uric acid was a product of deficient oxidation

and its presence in unusual amount in the urine led to the administration of oxidizing agents, such as nitrohydrochloric acid. Horbaczewski was the first to give us a start in the right direction in the study of uric acid metabolism, and we now know that, in a general way at least, the amount of uric acid formed is a measure of the metabolism of nucleoproteids, and since these are found in our daily food we have two sources of uric acid: the exogenous that comes from the nucleoproteids of the food, and the endogenous that result from the metabolism of the nucleoproteids of the body itself. Quite naturally the daily output from the first source is quite variable, depending upon the kind and amount of food, while that from the second source is fairly constant in the individual, but quite variable as between individuals. However, all the uric acid formed in the body is not eliminated as such and there is some doubt as to the form in which the lost part is eliminated. It may possibly be converted into urea, allantoin, glycocoll or oxalic acid, or into two or more of these. In this connection the recent suggestion of the etiological significance of glycocoll in gout is interesting.

Professor Morgan is not ready to satisfactorily explain why "the power to regenerate lost members" is so feeble in man and other high vertebrates compared with the ready regeneration observed in some of the lower animals; however, he thinks that it is due to the fact that the different tissues regenerate at different rates and consequently there is lack of cooperation and harmony in development. The skin regenerates; the muscle does so, though less well; nerves and blood-vessels regenerate, and the bones have a not inconsiderable power to mend. Hence, the failure to develop a new limb does not appear to be due to the failure of the individual elements to regenerate, but to their failure to regenerate concurrently.

Professor Minot offers an interesting scientific explanation of "the nature and cause of old age." He thinks that senescence is due to a relative increase of the protoplasmic to that of the nuclear content of the cell. "Growing old, in other words, consists primarily in an increase in the proportion of protoplasm. We thus have a cytological mark by which old age can be distinguished, and we are able to connect senescence with visible changes in cells: we are able to say there is a histological basis or cause of old age." He shows that the animal grows old most rapidly during intrauterine life and that after birth the rate of growing old decreases. However, what is ordinarily denominated as old age is, from the intellectual side at least, the reaching of a point where the accumulated losses result in comparative mental fixity. Changes in the nervous system diminish its adaptability and we are not able without ever-increasing difficulty to turn to new forms of mental activity. We may continue to do well the kind of thing which we have learned to do, but if we try to overstep the limits of our acquired expertness we find that we are held up by a sense of permanent mental fatigue.

Professor Webster discusses quite exhaustively "modern views regarding placentation" and the text is accompanied by explanatory figures.

Professor Smith discourses in a broad, scientific way upon "the parasitism of the tubercle bacillus and its bearing on infection and immunity." The thesis held is that the tendency of such a chronic disease as tuberculosis is towards a balanced parasitism with reduced mortality but probably with increased morbidity. The effect of immunization of man, if it ever can be attained, on the destiny of the tubercle bacillus is an open question. Trying to stamp out tuberculosis by increasing man's resistance should be secondary to efforts to destroy the bacillus. The former is a compromise and a recognition that the bacillus is here to stay, and if it be permitted to continue among us, as we increase our resistance, it will probably grow in its virulence. Increased resistance may save the individual, but to save the race we should destroy all tubercle bacilli, and knowing how they find access to the human body and how they leave it, this does not seem an impossible task. Cer-

tainly it is one in which every intelligent man and woman should take an active part.

Professor Howell in the last lecture treats of "the cause of the heart beat." After dwelling for some time upon the arguments for the two theories, the myogenic and the neurogenic, he concludes that the weight of evidence is in favor of the former. Then, he discusses the deeper and more fundamental question of the initial cause, whether acting through the nerve or directly on or in the muscle. He calls attention to the influence of the inorganic salts, especially those of calcium, first observed by Ringer and concludes as follows:

> The well-nourished heart contains a large supply of energy-yielding material, which is in stable form, so that it neither dissociates spontaneously, nor can be made to do so by the action of external stimuli. It is possible that this stable, non-dissociable form consists of a compound between it and the potassium or the potassium salts and that herein lies the functional importance of the large amount of potassium contained in the tissue. This compound reacts with the calcium and sodium salts, and a portion of the potassium is replaced and a compound is formed which is unstable. At the end of the diastolic period this compound reaches a condition of instability such that it dissociates spontaneously, giving rise to the chain of events that culminates in the normal systole. This dissociation may be made to take place prematurely by an external stimulus, such as a mechanical or electrical shock applied to the heart at any time after diastole has begun.

The first course of lectures before the Harvey Society forms a valuable contribution to medical science and the members are to be congratulated on their wise selection of lecturers.

VICTOR C. VAUGHAN

Deutsches Bäderbuch. Prepared with cooperation of the German Imperial Health Office. Quarto. Pp. civ + 536 and 13 colored plates. Leipzig, Weber. 1907. Price 15 M.

It is believed that this book will prove of interest to scientists engaged in various lines of work. It is the joint work of a number of distinguished chemists, clinicians, pharmacologists, geologists, meteorologists, etc., and is designed to give a complete, impartial account of the leading German baths and mineral springs from various points of view. The greater part of the volume is occupied by detailed chemical analyses, but with these is given much valuable information concerning the geology, climatology, etc., of the individual springs. Especially noteworthy and of very general interest are the introductory chapters on geology, chemistry, climatology, pharmacology, and general therapeutic uses of baths and mineral springs; there is also a short chapter on the radioactivity of mineral springs.

An examination of this volume will well repay any one whose work is connected in any way with this subject. The economic importance of this subject is indicated by the fact that nearly $100,000,000 are spent annually at the German baths and springs.

R. H.

Further Researches on North American Acridiidæ. PROFESSOR A. P. MORSE. Publication No. 68 of the Carnegie Institution, Washington, 1907.

The second report on North American Acridiidæ by Professor A. P. Morse is an interesting pamphlet of 54 pages, a frontispiece and nine plates. This, like the first report, is a well-prepared paper and treats of the acridiian fauna of the central southern states. General notes on the regions traversed and the life zones of localities visited are followed by a discussion of locust coloration and variation. Habits and habitats are discussed in connection with various local lists and then follows a detailed list of localities at which collecting was done and an annotated list of the 124 species of Acridiidæ taken. The plates are from photographs taken by the author and represent typical habitats of some of the species taken.

A. N. CAUDELL
U. S. NATIONAL MUSEUM

Catalogue of Type and Figures, Specimens of Fossils, Minerals, Rocks and Ores. GEORGE P. MERRILL. U. S. Nat. Mus., Bull. 53, Part II., Washington, 1907, pp. 370.

The second part of the "Catalogue of Type and Figured Specimens" in the Department of Geology of the United States National Museum consists of three sections in continuation of the Catalogue, Part I., dealing with the fossil invertebrates; section II. treats of the fossil vertebrates, section III. of fossil plants and section IV. of minerals, rocks and ores.

All working paleontologists will welcome this volume as one which will greatly facilitate their work, and botanists in general will find section III. of much value. This part, constituting the greater portion of the volume, has been compiled by Dr. A. C. Peale, with the cooperation of Dr. F. H. Knowlton and Mr. David White. The specimens are described under their catalogue numbers, and the description in each case includes the name, authority, locality and geological horizon, together with citation of publication giving the first description and figure.

The entire catalogue closes with January 1, 1905, and includes all changes to that date. It may, therefore, be regarded as substantially up to date. D. P. Penhallow

N. H. Abel. Sa vie et son œuvre. Par Ch. Lucas de Pesloüan. Paris, Gauthier-Villars. 1906. Pp. xiii + 168.

The writing of popular or semi-popular biography of scientific men, like the sketch of Faraday by Tyndall, or of Clerk Maxwell by Glazebrook, is highly commendable. A popular biography of a mathematician like Abel, who, though he died at the age of twenty-seven, made, according to Hermite and Sylvester, several discoveries of such originality as probably to keep mathematicians busy for one hundred and fifty years in the fuller unfolding of his ideas, can not be without interest. Mr. de Pesloüan, the author of the present sketch, has done his work fairly well.

In the case of a few technical matters he did not exercise sufficient care in the reading of the proofs, but with that exception the work is creditable. This booklet does not pretend to offer new facts on the life of Abel, nor is it intended to supplant the larger biography, written in 1885 by C. A. Bjerknes. De Pesloüan exhibits great admiration and much sympathy for the subject of his sketch. The title-page is preceded by a good picture of Abel. Florian Cajori

DISCUSSION AND CORRESPONDENCE

AN ADAMS JOURNAL CONDUCTED BY THE AMERICAN EXPERIMENT STATIONS

The interesting communication of Dr. H. J. Webber, in Science of October 18, touching the publication of research to be made under the Adams Act, is quite timely and, as to every point discussed, most commendable. Formerly connected with one of the stations and yet deeply interested in the work, a teacher in an agricultural college, and publisher of the *Journal of Mycology*—on one or all these grounds may I take the liberty of offering some suggestions.

The necessity of such a publication—distinct from the popular bulletins—could not for a moment be questioned. I believe the plan essentially as proposed could be carried out. A committee of three for each subject or division, elected for three years (election of one member each year) but eligible for re-election, to pass on the completed work submitted by the directors of the stations, would doubtless be acceptable to all. Here, of course, if anywhere, there would be friction—*censorship!* some one would be sure to say!—yet the arrangement would probably and almost universally encourage, not discourage, investigators.

The classification is on a generous scale, and could be taken up, one division after the other as occasion demands. But I would suggest that the name *Adams Journal* (conducted by the American experiment stations) be used; that series be established, as "Agronomy Series, No. 1" (No. 2 *et seq.*); "Horticulture Series, No. 1" (No. 2 *et seq.*); "Plant Pathology Series, No. 1" (No. 2 *et seq.*), etc. Each number should contain only an investigator's work on one subject; a full index should be appended to each number, and the numbers should be sold separately (at or below cost). The pagination should be continuous

in each separate series, and a title page, table of contents, and complete index furnished when the accumulated numbers warrant the closing of a volume.

It would be rash to anticipate a large subscription list; it would be in the beginning at least quite insignificant. But the stations are under obligation (moral, if not legal) to publish and publish properly what they do. Publication is in fact the inspiration of the investigator—the most precious part of his reward. Whether station workers should receive copies of the published work in their own lines free (*and exchanges with scientific journals inaugurated!*) could be settled later, but let us hope that the decision would not be in the negative.

Would this scheme of publication interfere with the patronage of existing scientific journals? I can not for a moment think that such would be the unfortunate case. On the contrary, they are bound to gain with the greater advance of scientific investigation in this country. The work done by college professors, students and independent investigators will not, under the circumstances, grow less, but more—and they now furnish the existing journals with the large proportion of the copy. Even with the establishment of an *Adams Journal* there would be, as now, some things the station workers would wish to publish, and could properly publish, in the existing periodicals. My own journal, so intimately connected with one line of station work, has been enriched heretofore by valuable contributions on mycological taxonomy from station workers, and I do not anticipate that there will be any conflict or that loss of patronage need be predicted.

W. A. KELLERMAN
OHIO STATE UNIVERSITY,
October 19, 1907

A "CENSUS OF FOUR SQUARE FEET"

TO THE EDITOR OF SCIENCE: The article by Mr. W. L. McAtee in SCIENCE for October 4, 1907, "Census of Four Square Feet," is extremely interesting, but some of his deductions therefrom, as far as insect and arachnid life are concerned, are wide of the mark. He concludes that insects are more abundant in the meadows than in the woodlands. But he has failed to take account of the trees and their fauna in the woodland. In the meadow the insect fauna is mostly concentrated on or near the ground; in the woodlands, on the contrary, the bulk of insect life is on the trees. There are many families of insects which rarely or never occur in meadows or on the forest floor, but do occur abundantly in trees. Four square feet of some forest trees would produce a great many specimens of insects; for example, a tree infested by Scolytids or with Coccidæ. Four square feet of foliage infested with Tingitids would have hundreds of specimens; if infested with gall-mites, would have millions of specimens. Four square feet of dog-wood blossom in the spring, if shaken, would produce a thousand minute Coleoptera. Four square feet of tree bark sometimes has hundreds of specimens of Psocidæ. These are all groups of insects practically unrepresented in meadows or on the forest floor, and some of them are food for birds. Even four square feet of forest floor with a few decaying fungi would produce hundreds of beetles and in some cases thousands of mites.

His figures for the meadow are not at all large; there are many spots where the Thysanura are much more numerous and where the mites would swell the figures to many thousands.

Many samples of meadow taken at different seasons would doubtless give an approximate idea of the insect and arachnid fauna of meadows; but no amount of samples of forest floor can give an adequate idea of the sylvan insect and arachnid fauna. Insects are more easily discovered in meadows than in woodlands, but the two regions are so variable that a comparison from selected spots has little significance.

NATHAN BANKS

THE OCCURRENCE OF HEROS IN YUCATAN

IN a recent paper by Mr. Thomas Barbour and myself,[1] which reported upon a collection

[1] Barbour, Thomas, and Leon J. Cole, "Vertebrata from Yucatan: Reptilia, Amphibia and

of fishes from Yucatan, we stated that *Heros affinis* and *Heros urophthalmus* had apparently been reported previously only from Lake Peten, Guatemala. In some unaccountable manner we overlooked, at the time of writing our paper, the report by Evermann and Goldsborough,[2] published in 1902, upon fishes collected in Mexico and Central America. Dr. Evermann has kindly called my attention to the fact that the species mentioned were both obtained in Yucatan by Mr. E. W. Nelson, as recorded in the paper referred to. It so happens that Mr. Nelson had specimens from exactly the same places that I obtained them, namely, *H. affinis* at Progreso and *H. urophthalmus* at Progreso and at Chichen-Itza. Some of my specimens apparently came even from the same watering trough at the latter place, but I was successful in obtaining them directly from both the Great and Sacred Cenotes as well.

In the same connection it is interesting to note that "Mr. Nelson heard that cat-fish occur in a well [cenote] at Chichen-Itza, but did not see any specimens" (*loc. cit.*, p. 138). From the Sacred Cenote I obtained two specimens of one species of catfish, and from another cenote, some three or four miles to the eastward, eleven examples of another. Both of these appeared to be new, and have been described and figured by Mr. Barbour and myself as *Rhamdia sacrificii* and *Rhamdia depressa*, respectively.

One would not have suspected the presence of these catfishes in the Sacred Cenote, as they were at no time seen swimming about. The two specimens described were obtained for me by the Indians, upon hooks baited and sunk to the bottom. At the other cenote mentioned, however, the catfish were much in evidence, swimming about in a large school near the surface. As Mr. Nelson probably did not visit this cenote, these facts may explain why he did not see catfish at Chichen-Itza. I do not understand, however, why he did not see the mojarras (*Heros urophthalmus*) in the cenotes when he was there in February, as I saw them commonly during the whole period of my stay from February 13 to April 9. Furthermore, I found that they were not especially difficult to catch, in spite of the fact that I had to resort to boyhood's method of using a bent pin for the purpose, not having suitable hooks at hand.

It would be interesting to know whether there is any basis for the belief of the natives that the fish disappear from these cenotes during certain seasons, as it would furnish evidence as to the existence of the supposed underground connection of these curious water-holes. On the one hand, unless there are such connections, it seems hard to account for the apparently general distribution of *Heros urophthalmus* throughout the peninsula (unless we take into account the possible assistance of human agency); while, on the other hand, the segregation of two species of catfish in two cenotes only three or four miles apart is difficult to explain if there do exist subterranean connections of any considerable size.

LEON J. COLE

Pisces," *Bull. Mus. Comp. Zool.*, Vol. 50, No. 5, pp. 146–159, pls. 1 and 2, 1906.

[2] Evermann, B. W., and E. L. Goldsborough, "A report on fishes collected in Mexico and Central America, with notes and descriptions of five new species," Bull. U. S. Fish Com. for 1901, pp. 137–159, 1902.

OCCURRENCE OF THE FRESH-WATER MEDUSA, LIMNOCODIUM, IN THE UNITED STATES

ON August 17, the writer received at the laboratory of the Bureau of Fisheries, Woods Holl, a few medusæ with the request for their identification. They had been sent from Washington on the fifteenth in a small bottle and were living when received and continued to live for more than a week, though gradually declining.

A cursory examination showed them to be a species of the fresh water medusa, *Limnocodium*, the occurrence of which in considerable number in Regents Park, London, in 1880 marked our first accurate knowledge concerning a medusa of this habitat. It was described by both Allman and Lankester, and its characteristics and something of its life history critically observed.

Great interest was aroused at the time, chiefly by reason of the then regarded anomalousness of its habitat, but also by reason of certain other features more or less peculiar, such as the apparent absence of female medusæ, and yet the occurrence of young apparently arising directly from eggs.

It has since been observed in several other localities and under a similar set of conditions, namely, in artificial tanks, or aquaria used for the cultivation of the large water lily, *Victoria regia,* a native of South America. Records of such occurrence have been made at Lyons and at Munich, in 1901 and 1905 respectively. In all these cases it has appeared and behaved in very much the same way as in London, and the same anomalous disparity of sex has been noted.

The discovery of the medusa, apparently the same species, though on this point I am not yet prepared to state definitely, in this country is naturally, therefore, a matter of some interest to students of animal distribution, and it is the hope of the writer that additional facts bearing upon several of the problems as yet unsolved may be secured. It was a matter of pleasure, therefore, to undertake, with the cooperation of the Bureau of Fisheries, to secure all the data and material which could be had. Thus far only a beginning has been made, and this preliminary notice is only intended to announce the general facts, reserving for a later contribution a fuller and more detailed account of the history of its occurrence. It may be noted in closing that, as in former cases, only male medusæ have been observed. And, furthermore, that no foreign plants have been introduced in these aquaria for several years, and that the *Victoria regia* has never been grown here.

P. S.—A communication was received by the writer dated September 30, stating that the medusæ had suddenly "disappeared as mysteriously as they came," and that not a single specimen could be found where for weeks they had been abundant.

CHAS. W. HARGITT
THE ZOOLOGICAL LABORATORY,
SYRACUSE UNIVERSITY,
September 20, 1907

GAMBUSIA IN NEW JERSEY

PROFESSOR JOHN B. SMITH has called attention to the introduction of *Gambusia affinis* in New Jersey waters as a check to the development of the mosquito, as neither he nor his assistants have met with it in their investigations. It was, therefore, with considerable interest that quite recently Messrs. H. Walker Hand and O. H. Brown assisted me in finding this little minnow in large numbers in Teal's Branch of Pond Creek, a small tributary of Delaware Bay at Higbee's Beach. We also found it very abundant in New England Creek, another tributary of Delaware Bay just north. There it was associated with large numbers of mostly young or small *Fundulus heteroclitus macrolepidotus, Lucania parva, Cyprinodon variegatus, Menidia menidia notata, Eupomotis gibbosus* and *Palæmonetes vulgaris.* The streams mentioned are mainly brackish, though fresh near their headwaters, more or less shallow with muddy bottoms, though with even a clear and gentle current. The males of *Gambusia* were equally abundant with the females, though the latter were usually larger. The occurrence of *Plethodon erythronotus* at Higbee's Beach is also interesting.

HENRY W. FOWLER
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COLOR SPORTS AMONG THE INSECTS

IN the August 16 number of SCIENCE Mr. A. Franklin Shull puts on record the occurrence of a pink katydid, *Amblycorypha oblongifolia* DeG., which was taken near Detroit, Mich., on August 12, and he invites others to place on record their captures of similarly colored insects. Professor J. B. Smith has, in years past, taken several pink katydids in the pine barrens of southern New Jersey, and on August 1 of the current year I took a male specimen of the above species at Lahaway, Ocean County, New Jersey. None of Professor Smith's specimens retained their delicate color more than a few weeks at most and the Lahaway example lost most of its pink color in about two weeks, though the head, pronotum, wing veins and parts of the legs are up to this date still a decided pink. The

specimen, when fresh, agreed very well with the description given by Mr. Shull, but it has a third row of brown speckles on the tegmina between the radial and cubital veins. Mr. Scudder's figure in the *Entomological News* is undoubtedly overcolored, being more reddish than pink and the speckles are also probably more prominently shown than really exists in the living insects.

Dr. Wm. M. Wheeler in a recent number of the *Journal of the New York Entomological Society* says, that of the twenty records of these insects the only male known is that taken by Mr. Scudder. Mr. Shull's specimen and the one under present consideration, both being males, are therefore of unusual interest.

The theory that the pink coloring is due to the influence of cold on the developing nymph seems to be completely upset when we consider that August 1 is an early date for a full-grown specimen and that the species is found until frost.

These pink "sports" are not confined to the Orthoptera but occur in the Hemiptera also. I took a pink specimen of *Amphiscepa bivittata* Say, a normally green insect, at Lakehurst, August 23, a rarity with this species; but the tettigonid, *Gypona octolineata* Say is almost as often pink as green in my experience.

John A. Grossbeck

SPECIAL ARTICLES

PLEISTOCENE TERRACING IN THE NORTH CAROLINA COASTAL PLAIN[1]

Terraces of Pleistocene age occurring in the coastal plain of Maryland have been described by Professor G. B. Shattuck in several papers, including the recent report on the "Pliocene and Pleistocene Deposits of Maryland." In the fall of 1906 the writer, while engaged in the study of the underground waters of the coastal plain of North Carolina for the United States Geological Survey, noticed similar terracing in that area, and a series of terraces extending across the state from north to south, separated from each other by well-defined seaward facing scarps which extend approximately in a north-south line, rising one above the other from sea level to elevations of over 400 feet along the eastern edge of the Piedmont Plateau, were traced out.

Reentrants, sometimes of great breadth, extend from the lower up into the higher and older terraces. In North Carolina the conditions existing during Pleistocene time were such that the terraces were formed over broad areas and each succeeding terrace was well developed and still preserves much of the level character which it had when first uplifted. The lowest lying and most recent terrace retains almost perfectly its original level surface, being but little dissected by stream erosion. Each succeeding higher and older terrace is more and more dissected until in the oldest and highest mere remnants of the former level surface remain and the separating scarps can only be traced with difficulty.

In general, the materials composing the terraces are thicker, more highly colored, more heterogeneous in composition, more highly cross-bedded, and contain a large per cent. of pebbles and boulders of the crystalline rocks near the Piedmont border than farther eastward. Seaward the material becomes finer, the deposits thinner and the coloring less brilliant, until in the lowest terrace the sandy loams are gray or mottled with a small amount of yellow, and grade down into interstratified bluish quartz sands and bluish to drab clays.

A noticeable feature in nearly all sections of the terrace materials is the gradation from a mottled sandy loam at the surface (the mottling at places showing evidences of being due to the disturbance of stratified material of slightly different colors) to stratified sands and clays or sands and gravels of different colors at the base.

The lowest lying and youngest of the terraces in the North Carolina coastal plain attains at its maximum development a width of over 60 miles in the northeastern part of the state. It includes the area enclosed by the present "banks" from Beaufort to the Virginia line and east of the meridian 76° 35′. In the southeastern part of the coastal plain this terrace is present only as a narrow strip

[1] Published by permission of the director of the U. S. Geological Survey.

fringing the shore and the larger rivers. Reentrants of this terrace penetrate the next higher terrace along the Chowan, Roanoke, Pamlico and Neuse rivers. The elevation of the surface of the terrace varies from sea level to from 20 to 25 feet at the foot of the scarp separating it from the next higher terrace. The uplift which formed this lowest terrace was so recent that the terrace is but poorly drained. Its surface is very level, and much of it is swampy. Within the area where this terrace attains its maximum development are the Hyde County and Great Dismal Swamps and Albemarle and Pamlico sounds. Both of the swamps include large lakes, resting in slight depressions in the terrace surface. Fossils have been found in the materials composing this terrace at several places.

Beginning at the Virginia line in Gates County, and extending southward to the coast in western Carteret County, then swerving southwest along the coast to the South Carolina line is a sandy ridge separating the two lower terraces. This ridge is well shown on the topographic maps of the Beckford and Edenton quadrangles of the United States Geological Survey. It is also well developed in western Pamlico and eastern Pender counties. The eastern side of this ridge is a well-defined scarp. The summit is sandy, with long, low, rolling sand hills extending north and south, their major axis parallel to the edge of the scarp. The elevations along this ridge vary from 40 to 60 feet. The land slopes off gradually on the western side of the ridge to a broad level plain, at an elevation of from 30 to 50 feet above sea level, the second terrace. This terrace extends as a narrow band across the coastal plain. About 10 miles in width near the Virginia line it gradually widens to the southward and in Pender County has a width of from 25 to 30 miles. The surface of this terrace while better drained than the lowest lying terrace still contains many large swamps, such as Angola Bay. Fossiliferous beds occur within the materials composing this terrace.

The next higher terrace lies at an elevation of 60 to 80 feet, with a width of from 20 to 25 miles. It is well developed in the vicinity of Williamston and Greenville and covers most of the Parmele and Falkland quadrangles. The scarp separating it from the 30- to 50-foot terrace is low and at many places the two terraces grade into each other in a manner similar to that in which the lowest lying terrace in some places passes gradually into the terrace at present being formed beneath the sounds. The eastern edge of this terrace is very irregular, although having an approximately north-south trend. Broad reentrants of the next lower-lying terrace extend far within its borders along the large rivers.

The fourth terrace has an elevation of 110 to 140 feet and is best developed in the Wilson, Tarboro and Rocky Mount quadrangles. It has a width of approximately 25 miles. The scarp separating this terrace from the 60- to 80-foot terrace extends approximately north and south and is steep and well defined. In the central and northern parts of the coastal plain the materials forming this terrace rest in many places directly upon the uneven surface of the rocks of the Piedmont Plateau. In this region, therefore, the higher terraces are but poorly preserved. The westward extension of the 110- to 140-foot terrace is limited by a long narrow ridge extending in a north-south direction through Nash, Wilson and Johnston counties. The elevation of the surface of this ridge varies from 220 to 260 feet. In appearance the ridge resembles that described as separating the two lower terraces.

On the western side of this ridge the land slopes gradually to the next higher terrace at an elevation of 180 to 200 feet. Because of the uneven surface of the Piedmont rocks this terrace is but poorly preserved north of Johnston County. Broad level stretches occur, however, in northern Sampson and eastern Cumberland counties.

Remnants of terraces at 220 to 260 feet and at 280 to 320 feet can be seen on the topographic maps of the Springhope and Kenly quadrangles. It seems probable, however, that accurate topographic mapping of the south-

western corner of the Coastal Plain in western Cumberland, Moore, Richmond and Scotland counties, where the coastal plain materials lie at greater elevations, would disclose well-developed terraces at these and greater elevations.

Conclusions.—In a short paper like the present it is impossible to go into details regarding the origin of these terraces. The present topography of the North Carolina coastal plain appears to be due to the successive formation, with the uplift of the coast, of the three sandy ridges described above, the latest of which is represented by the present banks or bars enclosing Pamlico, Albemarle and Currituck sounds, and the formation of the several terraces within the areas thus enclosed.

The marked difference in elevation of the coast in the northern and southern parts of the coastal plain of this state is due to the fact that the lowest lying terrace borders the coast from Bogue Inlet north while to the south the next higher terrace fronts on the shore.

Terraces at these same elevations appear on topographic maps in Virginia and Maryland.

B. L. Johnson

U. S. Geological Survey

PLANT ZONES IN THE ROCKY MOUNTAINS OF COLORADO

In order to see the true relations of the flora of a mountain region some sort of classification into zones is necessary. Humboldt and later other students have pointed out the zonation on mountain sides and the zones have been delimited with greater or less accuracy. In order to call attention of my students to the zonation in our own Rocky Mountains I have prepared a classification which is proving useful for teaching purposes. It emphasizes to the student the various climatic and edaphic influences which accompany changes in altitude.

Schimper's three regions of mountains,[1] the *basal,* the *montane* and the *alpine,* are not exactly represented in the Rocky Mountains. Thus the *basal* region of Schimper is "like that of moist stations in the lowlands." In the Rocky Mountains there is no such basal region. In fact there are no true lowlands near the mountains to be used for comparison and the foothill plants are not like those of gulch and stream-side in the plains region. Schimper's *montane* region has a flora "resembling that of the lowlands in higher latitudes." In northern Colorado this zone would extend from about 8,000 to 10,000 feet in altitude. Here the general character of the vegetation reminds one of the northern parts of New England, Michigan, Wisconsin and Minnesota. Above 10,000 feet I believe it more conducive to clearness to make two zones—an alpine and a sub-alpine—the former including everything above "timber line."

The following classification of the zones of plant life is suggested as pointing out what the limits of the zones seem to be. I am by no means sure that the names used are the best which might be selected. The zones here indicated are those recognized along the eastern slope of the Rocky Mountains, especially in northern Colorado. The names and characterizations are offered in the hope that they may call forth criticism from other students of Rocky Mountain vegetation.

1. *Plains Zone.*—Altitude up to about 5,800 feet. This is a grassland formation, the grasses interspersed with and sometimes displaced by coarse composites. Trees and shrubs occur only along water courses or on rock ridges and buttes.

2. *Foothill Zone.*—Altitude 5,800 to 8,000 feet. This is generally a rather open forest of rock pine (*Pinus scopulorum*) on hillsides with a few scattered cedars (*Sabina scopulorum*), while there is a mixture of Douglas spruce (*Pseudotsuga mucronata*) on north slopes with some deciduous trees in the canyons and draws.

3. *Montane Zone.*—Altitude 8,000 to 10,000 feet. This is a closer forest than that of the preceding zone. Lodgepole pine (*Pinus murrayana*) is the dominant forest tree, frequently forming dense, pure forests. Rock pine

[1] Schimper, "Plant Geography" (English translation), p. 702, 1903.

and limber pine (*Pinus flexilis*) occur at various places and Engelmann spruce (*Picea engelmanni*) comes in at the upper limit of the zone.

4. *Sub-alpine Zone.*—Altitude 10,000 to 11,500 feet. This zone is characterized by forests of Engelmann spruce with limber pine and balsam fir (*Abies lasiocarpa*) as secondary species. Huckleberries are abundant as shade plants on the forest floor. A considerable amount of grassland or steppe occurs in the form of mountain meadows in the upper part of the zone. "Wind timber" runs up in tongues to various altitudes and there are small patches of this scrub formation isolated from the main mass below. Numerous ponds and bogs occur along stream-courses.

5. *Alpine Zone.*—Altitude 11,500 to 14,000 feet and higher. This is a rock-desert and steppe zone. Mat-forming plants and deep-rooted perennials are common. Large areas, consisting of rock heaps and boulder fields, are practically destitute of all vegetation except lichens. Sedges and grasses are numerous in species but seldom form a dense sod, being mixed with various flowering herbs. Dwarf willows occur, often forming a dense scrub over large areas, but there are no other woody plants.

FRANCIS RAMALEY
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THE INTERCOLLEGIATE GEOLOGICAL EXCURSION

THE seventh annual New England Geological Excursion was held at Providence, Rhode Island, on Saturday, October 26, under the leadership of Professor Chas W. Brown, of Brown University.

Friday evening a short conference was held at which the route planned was explained. The purpose of the trip was to study the undisturbed Carboniferous shales and sandstones with their fossil contents that occur east of the city of Providence and the graphite mine and sheaved basal conglomerate to the west of the city. Professors B. K. Emerson, J. B. Woodworth and Chas. W. Brown explained the structural and metamorphic features of the sections visited. The attendance of professors and graduate students was rather larger than in previous years.

In addition to the advanced students and teachers from the high schools and normal schools the following institutions were represented in the party of seventy: Amherst, Professor B. K. Emerson; Brown, Professors Brown and Ward; Colby, Professor H. E. Simpson; Holyoke, Professor Mignon Talbot; Harvard, Professors Johnson, Wolff, Woodworth and Dr. Mansfield; Massachusetts Institute of Technology, Professors Jaggar and Daly and Dr. Shimer; Smith, Miss Aida A. Heine; Williams, Professor H. F. Cleland; Yale, Professors Barrell, Gregory and Schuchert; Worcester, Mr. J. H. Perry; Worcester Normal School, R. M. Brown.

The next meeting will probably be held in the northern Berkshires in the vicinity of Williams College.

HERDMAN F. CLELAND,
Secretary

THE LAMARCK MEMORIAL

MR. ALEXANDER AGASSIZ, Professor Henry Fairfield Osborn and Professor Bashford Dean, members of the International Committee from the United States, have issued a statement to the effect that the International Committee entrusted to secure funds for the monument to Lamarck has up to the present time received subscriptions amounting to about 25,000 francs. And the prompt response to the notices sent out by the committee has been, in many cases, very gratifying—Montevideo, for example, sending in the names of seventy-seven subscribers. There remains to be raised, however, the sum of 5,000 francs. And it is with the hope of securing the final amount that the American members of the committee are sending out this second notice. It is earnestly wished that this sum be contributed from the United States, in view of the influence which Lamarck has had upon the evolutionary conceptions of many and prominent American naturalists.

Subscriptions should be sent, as soon as possible, to Bashford Dean (Columbia University, New York), who will duly acknowledge and transmit them to the headquarters of the committee in Paris.

AN ACADEMY OF SCIENCES FOR ILLINOIS

Dr. A. R. Crook, curator of the Museum of Natural History of the State of Illinois, has addressed the following letter to men of science in the state:

"There is a widespread belief that our state should proceed to establish an Academy of Sciences. Ours is one of the few states in the middle west which is without such an institution.

"I. Such an academy will furnish an efficient medium for reaching all the various scientific groups of the state when scientific matters of public interest and common welfare are to be presented.

"II. At its meetings men of science throughout the state may interchange ideas and make the personal acquaintance of men working perhaps in other lines or of men known hitherto only by their writings.

"III. Men of greater achievement and success will inevitably stimulate and encourage beginners and men of less attainments.

"IV. The important contributions to knowledge made by the scientific men of Illinois will be disseminated so that all of us may learn of the important researches, inventions, and applications which are being made by our fellow citizens.

"More than one hundred men in different universities, colleges, normal and high schools, and museums have expressed their interest.

"The Academy should comprise every worker in science in the state, its roll being an almost complete scientific directory for Illinois.

"You are invited to be present at a meeting which will be held for the organization of such an institution at Springfield, on Saturday the seventh of December, 1907.

"The meeting will be held in the Senate Chamber of the Capitol at 10 o'clock in the morning."

SECTION G, BOTANY, OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The coming meeting of the American Association for the Advancement of Science will take place at the University of Chicago from December 30, 1907, to January 4, 1908. The sessions of Section G will be held in the Hull Botanical Laboratory.

It is important for the satisfactory prosecution of the business of the secretary that the titles of papers, accompanied by brief abstracts of not more than 200 words, be in his hands a few days before the initial date of the convocation. Inasmuch as the office of the secretary is at too great a distance for quick mail service, members are particularly requested to forward titles and abstracts to the secretary in care of Dr. Henry C. Cowles, Hull Botanical Laboratory, University of Chicago, Chicago, Ill., in whose hands they should be not later than December 20.

F. E. Lloyd,
Secretary, Section G

Mazapil, Zac., Mex.,
November 1, 1907

THE CENTENARY OF THE GEOLOGICAL SOCIETY OF LONDON

One hundred years ago, a handful of men in England, convinced that speculation is not true science, organized the Geological Society of London. With the foundation of that society the era of speculation came to an end, that of investigation began and geology, as we now know it, was born. Throughout one hundren years, the society has adhered consistently to the original policy, discouraging mere speculation but encouraging comparative geology. In its voluminous publications one finds results of study in all parts of the world and its members have proved themselves in many cases veritable helpers to students in newly settled countries. The list of presidents tells of the society's influence, for the names of most of them, from Greenough to Geikie, are as household words among geologists of all lands.

The centenary of the society was celebrated in London on September 26, 27 and 28 of this year. More than one hundred delegates representing an equal number of societies came from other countries with greetings to the parent geological society, while representatives from nearly every important scientific association in Great Britain and Ireland were

present. No doubt the number of foreign delegates would have been much greater had the date been somewhat earlier; but as it was, men came from all parts of the world, Japan, India, Australia, Africa and both Americas, while, of European nations, all except Spain, Turkey and Roumania, appear on the roll. This widespread interest proves the general appreciation of indebtedness to the old society.

In accordance with custom, the celebration was preceded by several excursions, which, considering the fact that field-work is no novelty to most geologists, were well attended and those sharing in them found profit as well as pleasure. The Highlands of Scotland attracted the petrographers; the Lake Region of England had much for geographers and South Wales was a magnet for those interested in applied geology.

The formal exercises began on Thursday, September 26. The president's reception of delegates and guests took place in the House of The Institution of Civil Engineers at 11 o'clock. The number to be received was so great that, in order to bring the session within reasonable limits, only one delegate from each country was asked to speak, the other delegates handing in their formal messages at the close of his address. Dr. Arnold Hague was chosen to present greetings in behalf of delegates from the United States and his graceful address proved that the choice was wise. In the afternoon, at the same place, the president of the society, Sir Archibald Geikie, delivered the presidential address, taking as his topic, the state of geology at the time of the foundation of the society. The speaker traced the development of geological thought, discussing the varying influences affecting it. There were many matters requiring delicate treatment before such an audience, but they were dealt with frankly, and at the close all recognized that the judicial attitude had been maintained throughout and that the address is an important contribution to the history of our science.

In the evening, the official dinner was given at the Hotel Metropole and every corner of that (the largest banquet hall in London) was filled. The dinner closed with the usual course of addresses, representatives of France, Germany, Switzerland and the United States being called upon to respond to toasts. One must not fail to note that speakers at both the reception and the dinner confined themselves with nearly mathematical accuracy to the time allotted—a condition almost without parallel on similar occasions, which led some to suggest that Sir Archibald Geikie had exerted hypnotic influence upon the orators. If that were the case, the long-suffering American community would be glad to import him to this country.

The twenty-seventh and twenty-eighth were devoted largely to making the visitors content with themselves and their hosts. The treasures in archeology, geology and related sciences, accumulated in the several museums of London, were opened up to groups of interested observers, and, under the guidance of the Canon of St. Paul's, that cathedral was examined historically as well as geologically—the latter relation possessing much economic interest. It may be remarked in passing that anxiety respecting the security of that structure seems to be superfluous. The cracks in the walls are not due to recent excavations for subways and deep cellars, but they are as old as the building itself, most of them having developed during construction, as foreseen by Sir Christopher Wren, who, as they appeared, made proper arrangement for redistribution of burden so as to prevent further trouble.

In the early evening of the twenty-seventh, a dinner to the delegates and invited guests was given by the Geological Club of London, which was a good example of "how to do it." Each member of the club was directed to annex some of the guests and to seat them with him at the table; the result being that groups of four or five with similar lines of study or with affinities of other sorts were brought together, making this a more than enjoyable meeting for many who were present. The formal exercises were brought to a close on that evening by a brilliant conversazione at the South Kensington museum, where many old acquaintanceships were renewed and some new ones converted into friendships.

On Monday, the thirtieth, many of the dele-

gates went to Oxford and many others to Cambridge. At each place the hospitality was profuse and honorary degrees were conferred on several geologists from the continent.

Unlike geological congresses, this meeting was not one for the reading of formal papers. As the president said to one of the visitors, the object was to have geologists see and know each other. In this respect the meeting was eminently successful. The commodious rooms of the Society in Burlington House, open for two weeks prior to the celebration, afforded every opportunity for men to become acquainted and full advantage was taken of the opportunity. The effect for good will last for a generation. It would be well if some one with genius for organization would take the method for a pattern and remodel the congresses so as to reduce reading of papers to the minimum and to increase the opportunity for personal contact, punishing by fine those who may neglect to utilize the opportunity.

Where all labored to make the celebration a success, it would be invidious to select any for particular mention; one may only congratulate the committee of arrangements upon the smoothness with which everything moved. Geological John Bull's idea of hospitality embraces much of genial common sense. It may be, as reported, that the Briton is slow in starting, but certainly, once started, his momentum is tremendous, carrying both willing and unwilling alike on a high wave of good cheer.

John J. Stevenson

SCIENTIFIC NOTES AND NEWS

Professor Major Ronald Ross, who left Liverpool on October 22 for Mauritius for the purpose of research in tropical medicine, and Mr. W. M. Haffkine were entertained at dinner on October 21 by the Liverpool School of Tropical Medicine. Sir Alfred Jones presided, and presented Mr. Haffkine with the Mary Kingsley medal of the school.

The council of the Royal Meteorological Society, at their meeting on October 16, awarded the Symons gold medal for 1908 to M. L. Teisserenc de Bort, of Paris, in recognition of the services which he has rendered to the science of meteorology. The medal was established in memory of the late George James Symons, the founder of the British Rainfall Organization, and is awarded biennially.

The College of Physicians of Philadelphia announces that the Alvarenga prize for 1907 has been awarded to Dr. William Louis Chapman, Providence, R. I., for his essay, entitled "Postoperative phlebitis, thrombosis and embolism." The next award of the prize, amounting to about $180, will be made on July 14, 1908. Particulars may be obtained from Dr. Thomas R. Neilson, secretary of the College of Physicians of Philadelphia.

The honorary degree of Ph.D. has been conferred on Professor Ernest Rutherford, of Manchester University, by the University of Giessen.

The Yale corporation has conferred the honorary degree of master of arts on Professor E. W. Brown and on Professor Ross G. Harrison, who have this year become members of the faculty of the university.

Sir Patrick Manson, medical adviser of the British Colonial Office, has been chosen president of the International Society of Tropical Medicine, organized during the recent International Congress of Hygiene.

Professor Baelz, of Stuttgart, and Professor Noecht, of Hamburg, have been elected presidents of the recently established German Society of Tropical Medicine.

Dr. Frank H. Loud, professor of astronomy and mathematics in Colorado College since 1877, has retired with an allowance from the Carnegie Foundation.

By the trustees of Clemson College the office of state entomologist has been separated from the chair of zoology and entomology of the college and located at Columbia, S. C. On September 11, 1907, Professor Chas. E. Chambliss resigned his position of associate professor of zoology and entomology to accept the appointment of state entomologist.

Dr. Heinrich Hasselbring, assistant in botany in the University of Chicago, has been appointed assistant botanist at the Cuban

Agricultural Experiment Station, at Santiago de las Vegas.

MR. A. K. CHITTENDEN has been appointed assistant in the United States Forest Service to investigate the White Mountain and Appalachian Mountain forests with a view toward the proposed national park. Mr. Karl Woodward has charge, for the U. S. Forest Service, of a study of forest conditions in Montana, in cooperation with the Northern Pacific Railroad Company. Mr. Chittenden and Mr. Woodward are graduates of the Yale Forest School and are sons of distinguished American men of science.

DR. J. ASHBURTON THOMPSON, M.D., permanent head of the department of public health of the government of New South Wales, has arrived in London.

AT a meeting of the Physico-chemical Club of Boston and Cambridge, held on Wednesday evening, October 30, Professor T. W. Richards spoke on "Chemical Research and Instruction in Berlin," and Dr. H. T. Kalmus presented a paper on "Some Properties of Fused Salts." Profesor Richards was elected president, Dr. A. A. Noyes vice-president, Professor Sherrill secretary and Mr. Frevert treasurer.

Nature states that on October 12 the Clifton (Bristol) Scientific Club celebrated its twenty-first anniversary by entertaining Sir William Ramsay and other past members, when Sir William, who was one of the founders of the club, delivered an address on the recent history of chemical science and on the nature of matter. On the previous evening he visited Clifton College, where he gave an account of the experiments by which argon and other gases of the atmosphere were discovered.

MR. HERMAN DEC. STEARNS, associate professor of physics in Stanford University, died of tuberculosis on October 21. Professor Stearns has been absent from the university on sick leave for the past three years.

THE death is announced of Dr. A. Fürtwangler, professor of classical archeology at Munich.

M. N. VASCHIDE, assistant director of the Laboratory of Pathological Psychology of the University of Paris, died on October 13, at the age of about thirty-three years.

THE Civil Service Commission announces an examination on December 4 to fill such vacancies as may occur in the positions of laboratory assistant qualified as textile and paper analyst and laboratory assistant in polariscopic work in the Bureau of Standards, Department of Commerce and Labor, at $1,000 and $1,200 per annum.

UNDER the will of the late Dr. Nathaniel Rogers, the senate of the University of London offers a prize of £100 for the best original investigations made on any medical pathological subject during the preceding two years. Candidates will be permitted to present papers published during the preceding year.

FOREIGN journals announce that a large meeting was held at Rangoon on September 19 to consider the establishment of a Pasteur Institute in Burma. It was resolved that the institute should be established at Maymyo. A committee was formed with powers to undertake measures preliminary to the formation of the institute. The subscriptions already amount to 80,000 rupees, which secures the success of the movement. Other subscriptions have been promised, which will be sufficient to enable the institute to start on a wide basis.

A TELEGRAM has been received at the Harvard College Observatory from Professor W. W. Campbell, director of the Lick Observatory, stating that prominent bright knots have been visible during the past week in Saturn's rings, two east, two west, symmetrically placed.

UNIVERSITY AND EDUCATIONAL NEWS

THE report of the treasurer of Yale University states that gifts and legacies to funds during the fiscal year have been $527,545, as compared with $629,705 the year before, corresponding figures for gifts to income being $112,238 and $250,602. The gifts, most of which have been already announced, include the Yale alumni fund, $52,692; the Belden

bequest, $105,000; the Seely gift, $100,000; the G. S. Woodward lectureship gift of $5,000; a gift of $3,055 to the library by friends of the late J. Sumner Smith; to the academic department five loan funds of about $2,000 altogether; the Abernethy fellowship of $10,000; the Milner fund of $45,125, and Witherbee scholarship of $10,000; the Ely professorship fund of $50,000 to the Medical School; and, to building funds, part of the Ross bequest to the library, $97,534, and the W. L. McLane bequest of $97,468. Gifts to income include $13,869 from the Carnegie foundation; $25,000 from the Yale Alumni Fund Association; $31,744 from William Kent; $8,600 from E. S. Harkness, and $8,800 from William Sloane for Dwight Hall improvements; and $3,300 from the National Lumbermen's Association for the Forest School. The W. W. Farnam accumulating fund has now reached $50,000, and its income becomes available for university purposes.

Gifts of $363,000 have been made to New York University during the past fiscal year. The value of the university's property holdings was said to be $5,130,000, on which there is a mortgage of $1,230,000.

The family of the late Professor Angelo Heilprin has presented to the Sheffield Scientific School the collection of lantern slides, comprising about 1,000 views taken by him in all parts of the world and used by him in his course in physical geography.

According to the *Umschau* there were last summer 3,132 teachers in German universities, of whom 1,333 were ordinary or full professors, 729 extraordinary or associate professors, 116 honorary professors and 1,054 privatdocents or lecturers. There are at Berlin 477 teachers, at Munich 226 and at Leipzig 224. The smallest number of professors is found at Rostock, Erlangen and Münster.

A fellowship in industrial chemistry, yielding $500 a year for two years, has been established at the University of Kansas by the Parke-Davis Company, manufacturing chemists of Detroit, Mich. Ralph C. Shuey, University of Kansas '06, is the first holder of the fellowship.

J. Fred Baker, B.S. '02, Michigan Agricultural College; M.F. Yale '04, has been appointed professor of forestry in the Michigan Agricultural College, in place of E. E. Bogue, deceased. Mr. Baker was in the U. S. Forest Service for a portion of '04; assistant professor of forestry for the State Forestry Commission of Pennsylvania, '05–'06, and professor of forestry in Colorado College, '06–'07.

At Harvard University, Mr. R. B. Thomson has been appointed instructor in botany and Mr. F. C. Blanck research assistant in biological chemistry.

The following scientific appointments have recently been made in the State University of West Virginia: John A. Eiesland, professor of mathematics; John L. Sheldon, professor of botany and bacteriology; Albert M. Reese, professor of zoology; Henry M. Payne, professor of mining engineering; Daniel W. Working, superintendent of agricultural extension work; Frederick R. Whipple, veterinarian; Welton M. Munsen, horticulturist; Clarence Post, assistant in physics; Margaret Buchanan, assistant in mathematics and Greek.

Dr. J. H. Grindley, of Liverpool University, has been appointed principal of the Government School of Engineering at Ghizeh, Cairo.

Mr. A. H. Lees, of King's College, Cambridge, has been appointed to the studentship in medical entomology for the period of one year. The studentship was recently established on the basis of a grant from the "Tropical Diseases Research Fund," administered by the Colonial Office.

We learn from *Nature* that of the four fellowships awarded last month at Trinity College, two were for classics; one of the remaining two was awarded to Mr. A. S. Eddington, senior wrangler in 1904, and the other to Mr. V. H. Mottram, of the natural sciences tripos, 1903, and first class (physiology) in the same tripos, 1905. Mr. A. Wood, who took his degree in chemistry and physics in 1904 as an advanced student, has been elected to a fellowship at Emmanuel College.